WATER RESOURCES

HEARINGS

BEFORE THE

SELECT COMMITTEE ON NATIONAL WATER RESOURCES UNITED STATES SENATE

EIGHTY-SIXTH CONGRESS

FIRST SESSION

PURSUANT TO

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OKLAHOMA CITY, OKLA., NOVEMBER 30, 1959

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WATER RESOURCES

MONDAY, NOVEMBER 30, 1959

U.S. SENATE,
SELECT COMMITTEE ON NATIONAL WATER RESOURCES,
Oklahoma City, Okla.

The select committee met at 9:30 a.m., pursuant to Senate Resolution 48, House Chamber, Capitol Building, Oklahoma City, Okla.

Committee members present: Senators Kerr (presiding), Hart, Moss, Schoeppel, and Case.

Also present: Senator Monroney.

Staff members present: Messrs. Schad and McBride.

The CHAIRMAN. We are mighty happy to be in Oklahoma for this hearing. This is the 18th hearing of our committee, whose purpose it is to determine the increasing needs of our Nation for water for agriculture, municipal and domestic consumption, and industry, and to determine how those needs can best be met and where they can be met.

Oklahoma is exceedingly fortunate in having here today some of the leading authorities on water resource development in the United States in the membership of this committee.

I am going to introduce them and ask them to just say "hello" to this great group of Oklahomans.

The only thing I am prouder of than I am of my association with the members of this committee in this work, is the association I have with the people of Oklahoma and the joint effort they and their congressional delegation are making to accelerate the development of Oklahoma's water resources.

First, I would like to present to you Senator Moss from Utah, one of the great western Senators and authority on water conservation in his part of our Nation.

Senator Moss.

STATEMENT OF HON. FRANK E. MOSS, U.S. SENATOR FROM THE STATE OF UTAH

Senator Moss. Thank you, Senator Kerr.

I certainly am pleased to be here today at this hearing in Oklahoma City. We previously had a hearing in Fort Smith, Ark., and then visited some of the eastern part of your State, including Senator Kerr's ranch there, and I enjoyed myself thoroughly.

I am very much impressed with the excellent work that is going on here in the State in outlining and preparing a program for water development and water conservation.

I come from a very arid State and for many years, in fact during all of our existence, we have had to develop and conserve water in order to exist. But I find that you are developing here a program of water conservation that seems to me to be going ahead even more rapidly than we are at the present time. I am very much impressed and I congratulate you sincerely on the fine work that is being done in Oklahoma.

This series of hearings has revealed to us that the conservation and development of water is indeed the No. 1 requirement in our Nation, and we hope that by coordinating all of this information and by working out an overall program that we can point the way so that the United States as a whole may develop its water resources so that we will not be limited or inhibited in our growth in the next 20 or 50 years but that we will be prepared to move ahead to develop the full potential of our great country. I am very happy to be here and to meet with you today.

Thank you.

The CHAIRMAN. Thank you, Senator Moss.

I have just been advised that our distinguished Governor has come into our room. We would like to have him come around to the witness chair because we are going to have the pleasure of hearing from him in just a few moments. In the meantime we would like to have our other Senators introduced.

From one of the great States in the Middle West, we have a distinguished Republican, ranking member of the Public Works Committee who has been a great friend of Oklahoma as he has worked with South Dakota.

He and his fine wife drove down here for this hearing, and it is a privilege indeed for me to present to this group of fine Oklahomans, one of the very ablest men in the Senate, and a very, very dear friend of mine, Senator Francis Case of South Dakota.

STATEMENT OF HON. FRANCIS CASE, U.S. SENATOR FROM THE STATE OF SOUTH DAKOTA

Senator CASE. Thank you very much, Senator Kerr.

It certainly is a pleasure for Mrs. Case and me to be in Oklahoma and Oklahoma City, particularly for this water hearing and one at which you are presiding.

It has been my privilege to be associated with Senator Kerr in the Senate Committee on Public Works. We work on such matters as roads, rivers and harbors, flood control, and water use problems.

Senator Kerr has taken the lead in the legislation for putting water to use for good purposes and is chairman of this select committee. He is performing a great service to the Nation.

We in South Dakota regard Senator Kerr (and I hope you will not misunderstand this, we are not really trying to appropriate him or anything like that), we do regard him as sort of a third Senator from South Dakota.

In turn, I try to be, when I can and when a matter of material importance to Oklahoma comes along, a third Senator for Oklahoma. But in South Dakota we have a few transactions that occasionally bring Senator Kerr to our State, including Angus cattle and pheas-

ants. We are proud to have him come up there, and I am proud to be here not only as sort of his guest, but as a member of this committee to talk with you and learn about the details of some of the problems which he has been presenting.

The CHAIRMAN. Thank you, Senator Case.

I am working on the Senator. He is one of the smartest men I ever saw to still be raising heifers. But he is a great pheasant shot and when he lines that automatic of his on those pheasants he gets them, and when he lines his sights on a project in the U.S. Senate he gets it too, because, as he said, we work together.

One of the friends I have made in the Senate is Phil Hart, of Michigan. One of the most interesting developments in the operation and work of this committee has been the presentation of facts from the States we call the humid States as distinguished from the dry or arid or semiarid States of the West. The humid States east of the Mississippi River are awakening to the increasing necessity for water conservation in their States.

Their industrial economy has developed until they are now straining the water resources that they have to the very utmost to be sure that they have an adequacy of water for the two decades ahead.

One of the finest hearings that we had was in Detroit, Mich., and Senator Phil Hart, a member of this committee, has given great leadership and cooperation to the overall program, and we are delighted that he is here.

Senator Phil Hart of Michigan.

STATEMENT OF HON. PHILIP A. HART, U.S. SENATOR FROM THE STATE OF MICHIGAN

Senator HART. Mr. Chairman, Governor, and friends, I am delighted to be here. I shall tell only one story, and I do this in public. Senator Kerr has not heard this.

The first Governor I ever met was right here in this building and his name was Kerr. He, of course, does not remember it but Governor Edmondson will understand what I mean when I say I learned very early that Senator Kerr is a patient man.

In connection with a major undertaking this Nation faced some years ago, I was at Fort Sill and on a pass decided that I would like to see what a Governor was like, and, by gad, the legislature was in session and I went into the Governor's office. I understand better now who those people are who were running in and out. But, lo and behold, in about 30 minutes Governor Kerr came out, shook my hand. I came from Michigan. There was no earthly reason for him to do that. So I learned long before I got to the Senate that Oklahoma is represented not just by a very successful man, a man who is a great storyteller, but a very kind man.

I am delighted to be here as his guest and yours.

Thank you.

The CHAIRMAN. I appreciate the interpretation you put on that, Phil.

I want to tell you right now I would not be entirely frank if I did not acknowledge that there is always the realization that while you might be a constituent today there is good hope that tomorrow will

improve the situation and while you might not be old enough to vote for a fellow today most of us will still be running when they do get to be old enough.

Now, from Kansas, comes one of the great friends we had through the years. He was Governor up in Kansas when I was Governor in Oklahoma. We call each other and visit and share the knowledge that we were learning the hard way on how to stay alive politically even though being Governor. A great bulwark in strength and friendship to Oklahoma is Andy Schoeppel from Kansas.

STATEMENT OF HON. ANDREW F. SCHOEPPEL, U.S. SENATOR FROM THE STATE OF KANSAS

Senator SCHOEPPEL. Chairman Bob and Governor Edmondson, my colleagues, and you ladies and gentlemen, as Bob has said this is a pleasant occasion for me to come into your great capital city on this important hearing, headed by your former distinguished Governor and your senior Senator.

And I can say to you, Bob, and those assembled here that I am somewhat disappointed that my State did not follow the lead on some of your suggestions earlier.

Your great State has made fine progress and mapped the course that can be followed by a lot of the other States.

I want to pay tribute to you at this time, as you are probably spearheading the greatest study committee in the history of the U.S. Senate, certainly in my time.

Our sister States have much in common, have had much in common for a good many years, and some of the pleasant relationships that I recall have been our association together, working at the State level and in the administrative level on many occasions.

And now the pleasure of working with you in Washington and on this important committee.

I am delighted to be here with all of you today.

The CHAIRMAN. Thank you very much, Andy. I will introduce members of our staff after a while.

Now it is our pleasure and privilege to hear from our Governor who, with his brother, has made great contributions to the program of water development in Oklahoma.

Governor, we are very happy to have you here and we will now be honored to have your statement. If you would rather sit where you are and face the audience, that would be fine.

STATEMENT OF HON. J. HOWARD EDMONDSON, GOVERNOR, STATE OF OKLAHOMA

Governor EDMONDSON. This will be all right here, Senator.

The CHAIRMAN. Yes.

Governor EDMONDSON. All right, fine.

I will do it here then.

Senator Kerr, distinguished members of the committee, and ladies and gentlemen, we have a quite distinguished group of authorities who will present the evidence that I know you are concerned with today insofar as this area of the United States is concerned—Oklahoma in particular.

Therefore, I will not go into detail as to making a general statement concerning the water situation in Oklahoma.

As I hope you know, I have already filed with the committee in Washington a detailed statement.

The CHAIRMAN. It is one of the best that we have received.

Governor EDMONDSON. Thank you, sir.

We have a good staff down here, Senator. Some of them are still here since you were Governor. They will cover the situation in Oklahoma in detail.

I do on this occasion want to take the opportunity to pay tribute to those of you who are giving your time, which I know many of you would much prefer spending back home, in traveling all over the United States and in particular coming to Oklahoma.

I agree with the distinguished Senator from Kansas that this probably will go down in history as one of the finest contributions to the development of the United States as has been made by any committee of the Congress of the United States in our history, because nothing could be more vital to the future of our country, of Oklahoma, your home States, and the other States of the Union, than such a vital resource as water.

Since the coming of the Spanish explorers into Oklahoma many, many decades ago, Oklahoma has had an abundance of water, but the trouble with it, Senator, has been that it has been traveling through Oklahoma and not staying here.

Therefore, our problem has been one of preservation of that which we already had.

The trend for many decades, of course, as you all know, was to overuse it, to improperly use the land and, as a result, fill up the streams which carried the water across Oklahoma.

Since that time, however, as a result of the action of men of vision, beginning probably with such a man as Senator Elmer Thomas and followed by such outstanding members of the house as Bill Schigler, Congressman from the old Second District, and our present delegation to Washington, and above all, the man who is serving as chairman of your select committee, the senior Senator from Oklahoma, Bob Kerr, we have had men with the kind of vision that has been necessary to look many, many decades into the future, and to see not only what the needs of our State would be 10 or 20 years from now but also what the needs of the Nation would be as well.

So men who were willing to take issue with the people of Oklahoma, such as Bob Kerr was, and be criticized both on the stump and in the press, prevented those who, looking at Oklahoma's rivers often said, "It would be much cheaper to pave it than it would be to make it navigable from blocking progress." But facing criticism such as that and still having the vision that Senator Kerr has had we have come many, many long miles along that road of conservation.

So it is today that Oklahoma's outlook is this:

One, first of all, of cooperation with the Federal Government which of course is playing the big role in the overall development, conservation, and utilization of the Nation's water resources.

So we will, in any way that we can, and I am sure I can say this speaking for both the members of the legislature in the field of legislation and also in the field of administrative action, be cooperative in

any way that we can with the actions of the Congress of the United States.

Also, I want you to be sure that Oklahoma is doing what it can on its own singular basis in helping to develop our resources, water as well as others.

We think that we have a full program underway.

We think that the wisdom of this great water program that the Congress is so active in was proved years ago and the evidence of that wisdom continues to be unfolded daily I am sure before this committee.

Therefore, the big question as we see it is not whether it is wise or not, not whether or not it will be done, but rather when should it be done.

Of course, along that line we sincerely believe and submit to you respectfully that the more action that can be taken and the sooner it can be taken the better for Oklahoma, its citizens, for the Nation, and the world as a whole.

As I said a moment ago we have a full program to be presented to you this morning, and I hope you will feel free during your stay here to call upon my office at any time we can be of any service to you in this study and also in making your stay in Oklahoma an enjoyable one as well.

Thanks very much.

The CHAIRMAN. Thanks, Governor, for an instructive, encouraging, and inspiring statement.

I am especially mindful of what the Governor has said about the unified effort of the people of Oklahoma and as I came into this hall this morning many memories were brought back to me of the great branch of Oklahoma's government that has used this room so long and the distinguished men that have been in it and are in it today and who with their colleagues at the other end of the floor in the Senate have been examples of Oklahoma's cooperation in the field of water resource development.

The key to the program both in Oklahoma and the Nation is cooperation, and I am happy that the people of Oklahoma are even more united today than ever before, determined to develop means to meet their water needs for today and tomorrow, and that the Oklahoma delegation, regardless of party, is united, working together, lined up solidly in the common cause.

We have a plan in Oklahoma for our two great river basins, the Red and Arkansas, a plan for both upstream and downstream development throughout the State, and the plan is being carried out. The Federal and State agencies are working together along with local organizations and leaders.

This is evidenced by the continuation of the Inter-Agency Committee, originally created to conduct the comprehensive survey of those two great river basins. It is an important vehicle in this unity, in harmony and cooperation; all of our people are devoting their time and knowledge and energies, working together getting the job done.

The folks are in there pitching and they know the facts. Occasionally we have a lone voice out yonder that gets out of key, out of harmony with everybody else, but one case of chronic laryngitis is not going to spoil our concerted effort and action.

The people will not be diverted by any such discord. We are going to continue to plan and work together until the job is done.

Now, I would like to present to you the director of our staff. You men who work in the legislature and for that matter, in the resource development commission and agencies and organizations know that the staff, the technical staff, make great contributions to the success of any effort and that is the case with this committee.

The director of our staff is Ted Schad. Ted, will you stand up and let these folks look at you. From the Interior and Insular Affairs Committee of the Senate we have one of the fine experts on water in Washington, Mr. Gene Eaton. We have Mr. Doyle Kline, representing Senator Anderson of New Mexico, who intended to be here but was not permitted by his doctor to get here.

I know the next man, but I cannot remember the State he is from—that is Phil Dickinson and he is from—where is that—oh, yes, California, California.

Assisting us from the office of Phil Hart is Muriel Ferris, a fine lady. We have from the Public Works Committee Johnny Mutz. The chief clerk of the committee is Paul McBride of Oklahoma.

From my own staff are Ada Lenz and Malvina Stephenson.

Now, I want to say that my self-confidence has been greatly reinforced by the wonderful things that have been said about me. I am going to introduce the fellow that I am not going to claim to be the greatest Senator in the United States. My respect for these colleagues and my own innate sense of recognition of merit would not permit me to say that he is the greatest Senator in the United States, but he is the greatest junior Senator in the U.S. Senate today and that is Mike Monroney. I understand he has just come in the room. Come on up, Mike.

Now, we next have a man who has not grown old, the appearance of the top of his head being in no way indicative of the years he spent among us, but he is a great guy and he is chairman of the Oklahoma Water Resources Board, Guy James.

Guy, will you come around and make a little statement?

STATEMENT OF GUY JAMES, COORDINATOR, BUREAU OF WATER RESOURCES

Mr. JAMES. Governor Edmondson, Senators Kerr and Monroney, and our visiting Senators, distinguished guests, and fellow Oklahomans, before I make any statement I have a little announcement I would like to make here.

There will be a luncheon in the Persian Room down in the Skirvin Tower Hotel at noon, honoring our guests, and you are all invited and urged to attend. I think you saw the tickets out on sale as you came in. We hope you will all be able to go.

We would like very much to acknowledge the very fine work done by the speaker of the house, Mr. Clint Livingston, in preparing the facilities for this meeting.

The CHAIRMAN. Is Clint here?

Mr. JAMES. He did a great deal of hard work on this thing.

The CHAIRMAN. Stand up, Clint.

Clint has a little more around the middle and a little more on top than Guy has, but not much more on top.

Mr. JAMES. He did a wonderful job anyway.

I would like to pay tribute here, for just a minute, to one of my very dearest friends, the dean of the water engineers of Oklahoma, Mr. Don McBride, who was not able to attend because of illness. We miss Don on occasions like this very, very much; insofar as water is concerned, Don is the third senator from Oklahoma. We always appreciate hearing from him.

Now the Oklahoma State Water Resources Board was chartered in the 1957 legislature with the responsibility of preparing all the technical information for the adjudication of water rights in Oklahoma. In Oklahoma, water rights are established by the courts but all the technical information has to be supplied them by the water resources board.

We are charged along with the health department and the corporation commission with the control and abatement of pollution. We are charged with the responsibility for negotiating interstate compacts with our neighboring States, the division of waters of interstate streams.

I would like to give you—and this is a little oversimplification, but I would like to give you just two examples of the thing we are trying to do.

The city of Tulsa bought a damsite at a location for an additional water supply on the Illinois River in eastern Oklahoma. Before, however, it is possible for them to build the dam and impound the water, we have to negotiate with our neighboring State of Arkansas a compact for the division of the water of the Illinois River because certainly Tulsa would not be justified in building a dam along the State line if immediately the water was intercepted where it crosses the State line.

And it is just that important and just that simple, that the division of these waters be made by interstate compacts.

One illustration of our pollution problem: In southwest Oklahoma, in Harmon County, there are a few salt springs, very small area out there, and they flow almost saturated salt water. Ocean water is about 35,000 parts per million of salt water. These streams flow about 200,000 parts per million of salt water and jump into Lake Texoma every 24 hours over 250 tons of salt. And that is over five boxcars of salt in Lake Texoma every 24 hours.

During the bad drought in the early fifties the city of Dallas made a temporary line in Lake Texoma to augment the water supply and get them over the emergency.

As a result of the salt in Lake Texoma they shipped in thousands of hot water tanks, and they could not put them in fast enough because they corroded out. Lawns and shrubs were killed due to the salt water. We think we can insulate these springs. As a part of our compact with our neighboring State of Texas, just a few days ago I met with the Texas water commissioner and he is very eager to cooperate. We think we can insulate these areas, very possibly hold by evaporation in a lagoon area this salt out of Lake Texoma and our neighboring State of Texas. If they do the same, gentlemen, we can upgrade Lake Texoma water where it will be satisfactory

for domestic purposes. Whereas at the present it contains entirely too much salt.

I mentioned that as one of the things we are working on and in cooperation with the U.S. Health Department, geological studies are being made now to bring this about and control this bad situation.

We have salt in the Cimarron and our neighbor to the north, Kansas, on the Little Arkansas, and we are making studies that would lead us to believe that when Keystone Lake on the Arkansas is completed it would be possible to make that water usable also.

I do not want to belabor you with any more detail. I want to introduce the coordinators of the program who will each lead the discussion in the subject assigned to him.

First will be "Future Water Resources Problems" in Oklahoma with the discussion led by Prof. George W. Reid, of the University of Oklahoma, as coordinator.

Stand up, Professor Reid, and let them take a look at you.

The next discussion will be statement of "River Basin Development" which will be led by Col. Francis J. Wilson.

The next topic that will be brought to your attention is a statement on "Water and Agriculture in Oklahoma," led by Forest Nelson.

And as to "Municipal Water Requirements," the discussion will be coordinated by our own Oklahoma City water superintendent, Mr. Morrison Cunningham.

The next, "Industrial Water Requirements," by H. L. Schall, coordinator, the executive vice president of the Chamber of Commerce of the State of Oklahoma. Herb.

And with that we will start the discussion under the leadership of Prof. George Reid.

The CHAIRMAN. At this point, Guy, I would like to put into the record a little statement. One of the finest organizations in Oklahoma interested in water development is the Oklahoma Farmers Union. Its president had intended to be here, but he left a message this morning that he was unable to make it. I just wanted the record to show his interest and I am going to invite him to put a statement into the record for himself and his organization which will be put in at an appropriate place.

(The statement of the Oklahoma Farmers Union follows:)

STATEMENT BY GEORGE STONE, PRESIDENT, OKLAHOMA FARMERS UNION

Gentlemen of the committee, having first obtained permission from your chairman, the Honorable Robert S. Kerr, U.S. Senator from Oklahoma, I desire to submit the following statement on behalf of the Oklahoma Farmers Union, consisting of 50,250 members, representing every section of Oklahoma.

This committee is charged with a terrific responsibility to the Nation. However, we feel that due consideration will be given every statement and document submitted and that your final report will be objective in nature, dealing with every aspect of your study. For this all should be grateful and appreciative.

Much good can come as a result of this study. Nothing could be more timely or important to the welfare of this Nation and the people than how best to develop and utilize our water for the beneficial use of mankind.

Rapid growth of manufacturing and other industry not directly related to agriculture in Oklahoma apparently is causing some shortsighted people to assume that agriculture is becoming less important. Nothing could be farther from the truth. As the number of farms and farmers declines, those who remain become more important, because a larger number of nonfarmers depends upon them for food.

An old Chinese proverb says: "The well-being of a people is like a tree; agriculture is its root, manufacturing and commerce are its branches and its leaves. If the root is injured, the leaves fall, the branches break away, and the tree dies."

Many years ago the great statesman, William Jennings Bryan, brought the idea home to America in these words: "The great cities rest upon our broad and fertile prairies. Burn down our cities and leave our farms and our cities will spring up again as if by magic. But, destroy our farms and grass will grow in the streets of every city in the country."

We are happy for Oklahoma's industrial growth. It means more prosperity for city people and better customers for farmers. But let's keep in focus the fact that agriculture is still the basic industry of our State or any State. People must eat and they can't do that without farmers.

During the drought years of recent date when agricultural cities and towns were experiencing critical water shortages, the Nation took a new look at what needed to be done to develop and utilize our water for the beneficial use of mankind. This is more important, even today, because of the increased consumption of water and the rapid increase of population. Increased demands for pure and usable water will be greater with each passing day.

We are going to have serious water problems within a few years. At the present rate of demand for water, there is no sure answer in sight for the needs within 10 or 20 more years, much less the more distant future. We are going to have serious food and fiber shortages since there is a most certain limit to our total productive capacity, yet, there seems to be no end in sight of our population growth to expand this demand for such products.

A proper national answer to the kind of water conservation program that is absolutely mandatory, cannot be provided except through the key program of all, the watershed approach.

All our flood control, antipollution, soil conservation, reclamation, and other programs are vitally important. However, these programs in their entirety will fail unless the whole watersheds of the Nation are mastered, controlled, and rebuilt.

Accordingly, projecting our thinking into the future, based upon the evident, rapid increase in population, we must realize that as our country grows, the various segments of our society become more interdependent and agriculture cannot stand alone—nor can a city or town.

Therefore, believing that water conservation and management start where the raindrops fall on the farmlands and rangelands in small agricultural watersheds, and realizing that what happens to raindrops that fall in the upper reaches of a small watershed, affects the man in town as much as it does the farmer, we respectfully recommend and trust that this committee will give major consideration to the role that farmers and ranchers can play in managing the water of our country.

One other thing that we should call attention to: when this formal program is concluded, an opportunity will be given to individuals and other interested organizations to make statements as they see fit here. One of these groups is the League of Women Voters, who have made water development their project for this year. They have done a teriffic amount of work on it and we appreciate it very much.

At this time, Professor Reid, will you come up here and start the discussion? And we will get into the future water resources problems in Oklahoma.

STATEMENT OF DR. GEORGE W. REID, DIRECTOR, BUREAU OF WATER RESOURCES, RESEARCH, UNIVERSITY OF OKLAHOMA

Dr. REID. You will notice from the program, that we have under this category, in addition to myself, Guy B. Treat, Joseph R. Assenzo, Hendon M. Crane, Dr. Grady F. Mathews, and Dr. Nelson Peach.

We are going to try to stay within the 40 minutes, and I am going to break ground with a discussion of the studies that we have made of the future requirements of the State of Oklahoma.

We have studied future requirements for several years now. First, in connection with the project is the projected canal from southeastern Oklahoma to central Oklahoma and then later on, as Mr. James has suggested, for the water resources, we have developed figures for compacting purposes between Kansas and Arkansas and Texas.

Our studies have been published. I can say this: The most recent ones were published this month and we have followed the conventional approach of water resource development for "future talking figures," as we like to call them, in only one respect and that is that we have used the conventional categories of municipal, industrial, and agricultural uses, and we have arrived at our figures by multiplying of the population estimate times the unit consumption estimate.

In order to do this the first thing we did was to explore the future population, the projections that we thought were reasonable for the State of Oklahoma, and we found that first of all that we could not use the past. If we used the past as a criteria or specification for the future Oklahoma we eventually would have no one here because we have had in the past a declining, slightly declining, population.

We felt that the past was no proper criteria and we tried to look and search for a single element that perhaps might be a key to the growth in the State and we feel that it is water.

We published this thing that we have given you, "Oklahoma's Problem." Maybe we should have called it "Opportunity." But at any rate we have based our criteria on the fact that if Oklahoma were to receive adequate water it would grow as well-watered States have grown and will continue to grow. So with this in mind we have come up with population predictions.

The method was fairly simple. We used population projections. We could take the RFF projects or any others that you like for the United States. We thought this was a large enough population group. We arrived at these values and then we sought a criteria to weigh these values that would show that the State, by increasing its water resources, would in turn stimulate the growth of the State in terms of population.

We used two factors for weighing the State values. One of them was density of population and the other was urbanization, and I would just like to consider these for one moment.

According to the last census in the United States the density of population was 51 per square mile and Oklahoma was 32 or below the national average, but such States as Massachusetts, New Jersey, and well-watered States in the East ran up to 600 to 650 per square mile.

I have had access to the RFF projections for the year 2000, and they anticipate that these States in the East will exceed 1,600 per square mile, which is roughly 2½ to 3 times of what it is at present. Oklahoma might arrive at a figure of, say, 54.

First of all, we felt that it was not to the best interest of the Nation to build up the dense populations in one particular area and it is not to the best interest of the individuals, and we feel that it is of the interest to the Nation to develop areas where we have low densities and on particular soils increased population.

With this in mind we felt there would be no migration out of the United States and there would be spillage from the rapidly increasing areas into areas that could absorb these populations.

And the criteria that we use in Oklahoma is one that considers increasing our water supply, thus being able to increase our population.

The same thing can be said for the percent organization. This was another weighting factor that we used: 64 percent urbanized in the United States, 51 percent in Oklahoma, and 75 percent in well-watered areas.

If we use the other projections you might end up with 90 percent urbanization in the well-watered areas whereas we use this as a criteria to weight the percentage average population in Oklahoma.

We came up with some general figures. I have the chart here.

I am very sorry but I think just the Senators will be able to see this and I am not so sure they will be able to see it too well.

The top line here, the one with the points, indicate our populations futures in the State of Oklahoma. In the year 1975 we anticipate 2,890,000 and the year 2000, which you are interested in, 4,500,000.

We went on up to 2025 and we called these talking figures, not estimates, where we have 5,380,000 people.

This has been published by the American Society of Civil Engineering in January of 1957. Since then we have devised a technique to take the State population that we have estimated and break it down county by county, and this has been devised by Dr. Peach.

The future requirement is the product of the future population and the future unit consumption. In order to do this we had to come to grips with what we thought might be the unit use of water. There is a lot of history in unit use of water insofar as municipalities are concerned. There is very little good information insofar as industry and agriculture is concerned. So what we did was to project again the unit consumption figures based on the general theses that we will develop our water resources and have water adequate enough to be able to use it and then use ratios to get the industrial component, and we used the land area and reasonable amounts of irrigation water for our agriculture and added these three together to arrive at our total findings.

The unit use is a point that is very difficult to come to grips with. At the present time, I believe Oklahoma is using about 103 gallons per capita per day.

The national average is about 140. In the well-watered areas that I keep referring to, which I would like Oklahoma to become, they use roughly two times as much water per head as we use. This is for municipal use.

If we take the composite use, the figures at the present time are about 1,300 gallons per capita use. This includes use for municipal purposes, direct use for industry, and use for agriculture.

We developed this premise—that Oklahoma could develop as well-watered areas have, and this means that we would begin to use more water. If we idealize this thing and make a study of what you and I would like to have, we come up with about 247 gallons per capita per day in terms of 35 percent industrial load. There is a 35 percent municipal load, the rest of it being commercial and public use. Where we said that, there would be water-using utilities in the family, the members bathing frequently, and we added up these figures and tried to come to some total on what grouping to use.

One thing we think is important is this upgrading of water use due to more water-using utilities. We made a study of this and it was amazing to me, and I do not quite believe the figures, but they are there, that is, that we are using at the rate of 120,000 new clothing washers per year and if you, say, amortize the clothing washer over a 10-year period it seems to be reasonable this comes out but only about 8 to 9 percent of the residents in the United States have these facilities.

We hope that as the Nation grows that more and more people will have the facilities to wash their clothes.

The use of automatic clothing washers increases the load far over the ordinary washing techniques by about 300 percent. So this again affects your unit consumption if these utilities are found in the house.

We have the same sort of statistics on dishwashers and disposal units. A disposal unit is sort of a two-hat proposition in that it not only affects the water use by about 1 or 2 percent increase of the total water unit consumption but at the same time it increases almost 100 percent the strength of the sewage which is another problem that you have.

So we tried to upgrade the use of water and say that this will use more water because it has more water and come up with unit consumption figures. In the year 1975, we had 148 gallons; in the year 2000, 185 gallons; and the year 2025, 235 gallons, approaching a total of about 250 gallons.

These are not unreasonable figures and I would like to stress one other thing. We feel in this part of the country that a lot of industry is switching from direct use, from wells where they get their own supplies, to municipal supplies. We have evidence to show this is nationwide. This switch means an increase in unit consumption or increased use from a municipal standpoint.

I think Mr. Cunningham will probably tell you later on, and I think I quote him correctly, in Oklahoma City he says they have evidence to show that industry is increasingly dropping its reliance on its own supplies and going to his municipal supply at the rate of increase of 1½ gallons per capita per year which means he is increasing and will be increasing at a greater rate than has been done in the past.

I talked to the officials in the city of Dallas and they are increasing at the rate of 2½ gallons per capita per year. We visualized about 1¼ gallons per capita per year in the State of Oklahoma.

I have another little chart here that shows the growth of the unit consumption in the State.

The CHAIRMAN. Does that represent both industry and domestic and municipal use?

Dr. REID. Only the industry that is used through the municipality, sir. There is still the direct industrial use. This was the second category that we tried to come to grips with and we find out that at the present time there is almost a ratio of 1 to 7 nationwide. In other words, seven times as much water used by industry as there is used by the municipalities.

In Oklahoma it is the other way around. The greatest portion of the industrial water is water that is used for cooling. So in studying ourselves we thought that in this State we have an opportunity to

develop in such a way so that we can hope to get industries that are not tremendous water users.

We hope to reuse water, study the reuse of water to the point where maybe we can actually increase the unit. If we had 100 gallons of water actually the amount consumed is only about 10 gallons. If we do this three or four times we have increased our unit use effectively as though it were 300 and not 100 gallons of water.

We hope by programing use and reuse and by conservation techniques and by very modest projections on cooling water which is the larger user to develop a ratio of approximately 1 to 1½, in other words, direct industrial use in Oklahoma would be 1½ that of the municipal use.

In multiplying the population by the projected municipal use I did come up with some figures here someplace. I had them. Yes. It would be 0.49 million acre-feet a year in 1975, 0.0945 in the year 2000 and 1.44 in the year 2025. That is on that chart down there. The second line shows the increase. It is divided into the industrial, agricultural, and municipal. Yes, the lines below and on the top line is the total.

With this in mind then the industrial requirements would develop more slowly. In the year 1975 it would be 0.29. This is in million acre-feet per year.

In the year 2000 it would be 1.3.

And in the year 2025, 2 million acre-feet per year which would develop the flow ratio of 1 to 1.5.

As to agricultural uses, we conferred with the Oklahoma State University—one of the few times we speak to each other—and we agreed. I heard last night all the Senators regardless of whether Republicans or Democrats agree on water. Well, the A. & M. College and we agree on water, too.

The CHAIRMAN. Is that the "udder" State university?

Dr. REID. Yes; I would like to use that.

For what we did we found in the State at the present time 300,000 acres are being irrigated and that we have a potential of about 2 million acres that could be irrigated.

We used a very conservative figure of 2⅓ feet per year for intensive irrigation. This is something we believe since it is going to intensive irrigation, because the economic returns are only justified for irrigation, when you go to intensive irrigation—this means no reliance on weather at all. Just use the land that can be irrigated, and there are limited lands that can be irrigated. And then in this sense we develop for the year 2000, 0.04 million acre-feet a year and 0.09 for the year 2025.

Summarizing these in the totals we have 1.4 million acre-feet a year in 1975, 3.67 in the year 2000 and 5.2 million acre-feet per year in the year 2025.

The CHAIRMAN. Doctor, right there, in order that I get a little better picture and maybe the record will reflect it in different units of measurements, is a million acre-feet approximately equal to a billion gallons a day?

Dr. REID. It is one point one times. You are right, it is approximate.

The CHAIRMAN. So that requirement for 5.3 million acre-feet per year means actually awfully close to 6 billion gallons of water per day?

Dr. REID. That is correct, sir.

The CHAIRMAN. Thank you.

Dr. REID. I get awfully confused, and it is my business, between million acre-feet and billion gallons per day, and we have had some difficulty on this.

The public municipal people used the billion gallons per day and we, in order to be in the same nomenclature as the Corps of Engineers and the Bureau of Reclamation—we have to go to this million acre-feet.

These studies have been published in the Journal of American Water Works Association. I have the publication. It is November 1959. We will supply it. It just came out this month.

I would like to show one other chart which shows the distribution of our water use.

At the present time, in Oklahoma, the greatest quantity of water used by municipal use, this category is 67 percent—20 percent is used by industry and 12 percent by agriculture.

We anticipate in the future a greater share of this to be the industrial use and a smaller share of course of the municipal use.

The CHAIRMAN. At that point I would like to call attention to one fact, Dr. Reid, and for the record:

Your chart shows that 67½ percent of the water requirements in Oklahoma now are for municipal uses, 20.5 percent industrial, and 12 percent for agriculture.

Last week at Albuquerque, N. Mex., we had a hearing similar to this for the State of New Mexico and the information they gave us there was that of this date 90 percent of their water requirement is for agriculture, 10 percent for municipal and industrial, and one of the statements they made to the committee was that if they could obtain 10 percent of the water now being used by agriculture it would double the water supply available to municipalities and industry. That shows the difference in the character of the problem in the two States. But it also shows the great advantage available to Oklahoma in the abundant supply of water we have.

Thank you.

Go right ahead.

Dr. REID. I have heard the rough figure that it takes 60 times as much water to keep a man employed on the farm as it does in the city. This would emphasize it again, as to the higher value of water to industry.

I would like to summarize by saying we have developed some figures. They are predicated on the development of our water resources and we call these talking figures.

I would like to emphasize to the committee that we feel it should encourage the Federal Government to increase its efforts on basic data collecting and extend these perhaps to studies that would elucidate where the water goes, so we can project these and come up with the unit consumption figures.

We are very weak in that information.

The next man to testify in my group is Mr. Guy B. Treat. Mr. Treat is vice president of the Arkansas Basin Development Association and has been and is a member of the Governor's tristate committee, a member of the Governor's long-range water study committee, chairman of the Oklahoma City Engineers Club Advisory Committee, and he is here to speak about one possible solution to bring more water to the State of Oklahoma, representing the Oklahoma Water Development Foundation of Oklahoma.

Mr. Treat.

The CHAIRMAN. Before Guy gives us his statement I would like to call attention to the fact that the Committee on Conservation of Soil and Water Resources of the State Legislative Council of the Oklahoma Legislature is here.

Its chairman is Senator Walt Allan; vice chairman Lawrence P. Howe.

Would the members of that committee who are in the room stand? They are right back there. Gentlemen, we are happy to have you.

STATEMENT OF GUY B. TREAT, CONSULTING ENGINEER, WATER DEVELOPMENT FOUNDATION OF OKLAHOMA, INC.

Mr. TREAT. Senator Kerr, ladies and gentlemen.

George has outlined to you in a general way my activities in this water business for, we will say, the past half a lifetime. Of course, it is not very long.

The plan that I am appearing before you today to speak about is a thought which occurred many years ago of bringing the water from our best water areas and where it was doing the least good up into central Oklahoma and at the same time accommodate all the territory between central Oklahoma and southeastern Oklahoma.

Basically the plan is made up of two major physical features, the first being a water warehousing unit consisting of a series of water supply and flood control reservoirs on the streams of southeastern Oklahoma where water is in plentify supply and, second, being a barge and water transmission unit composed of a three-prong canal system emanating from the central hub located near Ada, Okla.

The first leg of this canal proceeds northwesterly to Oklahoma City from the central hub. This leg would be a joint navigation and water supply canal.

The second leg proceeds southeasterly from the central hub to tap the reservoirs of southeastern Oklahoma. This leg would be part water supply and navigation and part water supply only.

The third leg proceeds northeasterly from the Ada junction to the Weber Falls Reservoir and this leg would be for navigation purposes only and it is a means whereby water transportation can enter the central Oklahoma area from the authorized Arkansas River navigation project.

The water from the warehouse unit in southeastern Oklahoma would be transported and distributed to all of the southeastern and central Oklahoma by the canal transmission system. Transported by this means in volume of 500 million gallons per day or greater it is estimated that excellent quality water can be delivered to central Oklahoma at a lower price than present water costs in the area. It

is estimated that the completed plan would furnish enough water to satisfy the demand of all uses until the year 2025.

The transportation of this abundant quantity of excellent quality water combined with water transportation would be the prime mover in a tremendous industrial development in southeastern and central Oklahoma.

The statement and documents which I have filed today contain complete information on the background, history, engineering, and economics as well as some new ideas and developments concerning this plan. The studies as sponsored by the Water Development Foundation of Oklahoma, Inc., and Oklahoma City Chamber of Commerce were initiated in 1954 by Col. F. J. Wilson, of Tulsa, and myself and have been continued to date.

At the present time, the U.S. Army Corps of Engineers is conducting a preliminary study as to the economic feasibility of the project.

The plan as briefly outlined to you represents a method of solving economic and water supply problems of this vital area in the heartland of the United States.

As stated before it would combine the uphill movement of large quantities of excellent quality water with water transportation, thus providing a spark to the development of Oklahoma industrial potentialities.

It is long range in scope but I believe it is the type of development which the United States needs to maintain its position of world leadership.

The development of our water resources at all levels creates wealth, and it is a sound and necessary investment in the future of our country.

Gentlemen, I thank you both for myself and for the Water Development Foundation of Oklahoma.

The CHAIRMAN. Thank you.

I would like to say to my colleagues on this committee that the man who has just spoken, while he speaks in a soft voice and gives the appearance of being shy, is really one of the great engineering brains of Oklahoma and has as much mental vision and courage as any man I know. I am glad he was here.

Dr. REID. The next man we have on our agenda here is Mr. Joseph Assenzo, Professor Assenzo of the University of Oklahoma.

He is a native of Massachusetts who has come out to work with us and has been working on water quality studies. He is fairly well qualified although he is young in business yet. He has worked with the consulting firm of Camp, Dresser & McKee in Boston that is an outstanding group in this field.

He has had his training at Harvard and Northeastern.

Joseph Assenzo.

STATEMENT OF JOSEPH R. ASSENZO, BUREAU OF WATER RESOURCES RESEARCH, UNIVERSITY OF OKLAHOMA

Mr. ASSENZO. My statement is for and on behalf of the Bureau of Water Resources of the University of Oklahoma. I filed a compilation of testimony being presented by the Bureau of Water Resources with the secretary.

My name is Joseph Robert Assenzo. I am professor of civil engineering and sanitary science at the University of Oklahoma. I am a registered professional engineer, and have received training at Northeastern University in Boston, and at Harvard University in Cambridge, Mass.

My experience in the field of sanitary engineering includes: several years of work with a consulting engineering firm in Boston, Mass.; 2 years as post sanitary engineer at Fort Carson, Colo.; a reserve officer with the U.S. Public Health Service; and work with the Oklahoma Bureau of Water Resources Research.

This paper is part of a two-phase report on the importance of water quality management, and presents the viewpoints of the sanitary engineering faculty of the University of Oklahoma. The second phase of the report presents the views of the Oklahoma State Department of Health.

With all of the future water use increases—per capita, industrial and recreational—there will be an acompanying increase in the quantities of wastes produced.

The present daily waste solids load contributed per capita is approximately 0.2 pounds. It is estimated that in the future—years 2000 to 2025—this figure will be 0.3 pounds per capita per day, due chiefly to greater usage of garbage grinders.

Therefore, not only will the quantity of domestic wastes increase, but also the strength. Industry will produce more of the wastes of which we now have knowledge, and in addition it will produce wastes from the manufacture of products yet unheard of or that are still under development. Again, the strength, as well as the quantity, will increase.

It has been estimated that there is enough water for the future except it might have to be moved from one area to another, because it is not in the proper place at the proper time. It has also been proposed to increase the water resources by weather control methods.

The new methods of treating saline waters will also add more usable water to the system. But in many areas there will still be a deficiency of water quantity. What does this means?

It means simply that we must reuse repeatedly the existing water resources. Consequently, water quality management is just as important a factor as water quantity. Quality must accompany quantity.

Presently some watershed systems are reusing their waters 2 to 10 times—Ohio, 6 to 10. It is envisioned that in the future, because of the increase in urbanization, which will result in the effluents of waste treatment plants being much closer to the influents of water treatment plants, the waters will have to be reused several times these figures.

It is also envisioned that in the future the water available to a city may be, in a sense, increased threefold to fourfold by proper programing based on use, domestic use first, and next industry by industry.

This is reuse of the city's water by the same city in addition to reuse by a second downstream city. Because of the future quantity and strength of wastes, the dilution factors, which up to now have played an important part in waste disposal, will no longer be as important as they are presently.

The present dilution factors for safe disposal are 4 cubic feet per second per 1,000 population equivalent for primary waste treatment effluent—about 35 percent removal of applied BOD load—and 0.5 cubic feet per second per 1,000 population equivalent for secondary or complete treatment effluent, or about 90 percent removal.

Let us consider a densely populated city, for instance the city of Chicago, Ill. The Metropolitan Sanitary District has some 5 million people living in 920 square miles. The waste to be treated by the sanitary district is the domestic waste due to these 5 million people plus an industrial waste load with a population equivalent to 4 million, or a total waste load with a population equivalent of 9 million.

This is a heavy load on a stream with a flow of approximately 3,300 cubic feet per second. The problem might not be too big now, but consider some time in the future several highly populated cities, with effluents of the same or greater magnitude, on the same stream and not too far apart, as far as stream distance and travel time is concerned, and the result is a heavily polluted stream that is unfit for use of any kind.

From all this one must come to the conclusion that (1) we will no longer be able to rely on dilution by the stream as part of the solution to waste disposal; and (2) that our present methods of treatment of the wastes as we now know them, are going to be inadequate in the future.

A stream has the ability to assimilate organic pollution by biological oxidation, a process we call self-purification of the stream. This assimilation ability will be decreased, because use of present treatment methods will result in overloaded streams. Bacterial organisms, change in dissolved oxygen or BOD, and concentrations of certain organic and inorganic substances are all presently used as pollution parameters.

These will still be important in the future, but not as important as they are now, especially because of repeated reuse of waters. We must, therefore, in addition to these, use other indexes to pollution.

We know from past research that a concentration of nitrate-nitrogen (NO_3–N) of 0.3 parts per million will stimulate algal growths of such intensity as to create nuisances—taste and odors, filter clogging, et cetera. We might, therefore, set a limit of, say, 0.25 parts per million of nitrate-nitrogen as our instream standard, and taking into account any assimilation by the stream, compute the concentration of nitrate-nitrogen that a city or industry can discharge safely.

The use of synthetic detergents has increased the concentration of another growth nutrient—phosphate. Again, this compound stimulates algal growths and thereby adds to the pollution of a stream.

Other pollutants that cannot be assimilated by nature and that are unchanged and become accumulative, and, therefore, detrimental to good water quality, are the organic chemicals, particularly chloroform extractables.

The U.S. Public Health Service in their water quality network stations, isolated one of these organic chemical wastes, which is toxic to man in high concentrations, on a carbon filter. The chemical was unchanged in amount for several hundred miles downstream, and

was found to pass through a conventional water treatment plant into the distribution system and back into the sewage system.

Again this points out that present treatment methods, for both wastes and raw water, are going to be inadequate for future advances by industry. Each day, more and more exotic chemicals are being produced, and we have very little knowledge, if any, of the effect of these on our water resources. At present, in order to determine organics it requires about 10 days and 5,000 gallons of waste for a carbon filter analysis.

This is a very inadequate method of analysis. Better methods are required. Perhaps nuclear activation and/or radiometric titration techniques might be the answer to the analysis problem.

Because of the disposal problem created by the increase in the peaceful uses of radioisotopes, the tolerance limits for man will have to be constantly reevaluated. To increase our knowledge of the future waste problems that will be created and to determine what indexes and standards to use require research at all levels.

As we stated previously, the present secondary waste treatment processes will be inadequate for future wastes. We must develop new methods that will enable us to remove these new exotic chemical wastes, as well as the present organics and inorganics—including the fertilizers or nutrients. Research will gain us a knowledge of the problems and using this knowledge as a tool, we shall be able to develop new treatment processes which will not even bear a resemblance to present day treatment processes.

Here in Oklahoma our streams are not presently overtaxed with domestic sewage. In the future this may not be so unless we start to plan for the future. Oklahoma, because of its natural resources, will be an excellent area for the location of petrochemical industries, and for the resulting exotic wastes.

One of the big problems at present is brine accumulation in some of the Oklahoma streams. The brine pollution in the Salt Fork of the Arkansas and the Cimarron Rivers is mainly from natural sources such as Great Salt Plain, Big Salt Plain, and Little Salt Plain.

The brines in the South Canadian River are mostly from oil well wastes. Just last week the U.S. Public Health Service noted a sodium chloride concentration of 228,000 parts per million in the Big Salt Springs of the Cimarron River Basin.

Some of the suggested techniques to improve the quality of the Oklahoma brine polluted streams are (1) injection of brine to underground strata; (2) upstream storage and evaporation ponds; (3) diversion to other watersheds; and (4) plugging of small trickling springs which contribute much of the brines.

Nitrogen and phosphorous are nutrients, or fertilizers; these, of course, are contained in the effluents of domestic sewage and some industrial waste treatment plants.

The question arises as to why should this fertilizer, literally, be allowed to go down the drain. The city of Norman, for example, discharges approximately:

(3 m.g.d.) (15 p.p.m. PO_4) (8.33)=375 pounds per day of phosphates.

In terms of commercial 5-10-5 fertilizer, this is equivalent to almost 4 tons of fertilizer down the drain, or 10 times 375. Oklahoma City discharges approximately (21 m.g.d.) (45 p.p.m. PO_4) (8.33)=

7,900 pounds per day of phosphates or 40 tons of fertilizer on a 5-10-5 commercial fertilizer basis.

At present these quantities cause no appreciable pollution problem, but in the future there may be a problem.

Current research at Oklahoma University is to alleviate this problem. Attached algae are being grown in the effluent of the Norman sewage treatment plant. The algae can be harvested and used as fertilizer or food supplement for animals and humans. This project is a sample of research at two levels—city and university.

The Oklahoma Bureau of Water Resources Research has collaborated with the Oklahoma State Health Department and several other State agencies to prepare water quality standards for the State. The standards are instream requirements. It is felt that these standards are flexible enough for the future. A copy of these standards are attached to this report.

At Oklahoma University, there has been conducted research on the treatment of phenolic trade wastes by biological slimes. These studies resulted in the design of three trade waste treatment plants. More research with biological slimes is presently being conducted.

More, much more, research is required in all of the areas mentioned in this report. But, in order to carry out this much-needed research, financial assistance is necessary.

We presently have two doctorate students. If we had enough financial assistance we could get several more.

Thank you.

The CHAIRMAN. Thank you.

I would like to interrupt here to invite any of the colleagues on the committee at any point to ask questions of any witness that they desire to do so.

Senator SCHOEPPEL. Senator Kerr, I would like to ask the distinguished witness a question on this matter of reuse of water. Do we have in this country at this time any outstanding examples where reuse of water has been studied and actually been in operation and has proven to be feasible and practical.

Mr. ASSENZO. I cannot point out any specific instances, but in the literature there have been cases where the municipality would use their water. The effluent from their treatment plant is used by the industry as cooling water so this is reuse of the water.

Dr. REID. Senator, one of the classic examples is the city of Baltimore, where the steel company uses the Baltimore city effluent for cooling water. All through the Southwest and out in California they use a lot of sewage effluent for cooling water for irrigation purposes.

The CHAIRMAN. Senator Monroney, did you have a question?

Senator MONRONEY. I would like to ask a question.

In considering building the airport west of Washington they found the sewage would pollute the Potomac and they had a good deal of research work done to determine whether they could run it through an atomic reactor and thus make it completely safe for human usage because of the high temperatures it would be exposed to.

Is there any solid study going on as to how these intense heats could be used for sewage treatment?

Mr. ASSENZO. Yes. The Simon process is a method of disposal of sludge with complete oxidation using heat. There are several other projects being used.

The CHAIRMAN. Complete oxidation through heat?

Mr. ASSENZO. Using heat.

Senator MONRONEY. You could also make use of fertilizers from domestic sewage, and it would be safe, would it not?

Mr. ASSENZO. Yes, sir.

Senator MONRONEY. Subjected to certain types of heat that might not be oxidation?

Mr. ASSENZO. Yes, sir.

Dr. REID. Thank you.

The CHAIRMAN. Thank you very much for a most challenging and interesting statement.

Dr. REID. We are a little guilty of using too much time. We apologize for that. We tried to keep ours down.

The next one is Dr. Grady Mathews. We have worked together with Dr. Mathews on the water quality management.

The State health department with Dr. Mathews as commissioner of health has the prime responsibility in the State and our interest is purely in research.

I would like to introduce to the committee at this time, Dr. Grady Mathews.

STATEMENT OF DR. GRADY F. MATHEWS, COMMISSIONER OF HEALTH, STATE OF OKLAHOMA

Dr. MATHEWS. Gentlemen, and Senators, I assure you that my speech will be very short, so be relaxed.

I have placed on the desk a copy of my statement which you can read at your leisure. I think it is excellent because I had a good engineer to write it, one of the best in the country.

I want you to know that when Senator Bob came up with quality or quantity of water I think quantity would fit better—you remember, Governor Bob, Senator Bob, when we had to make the rounds when the whole State was flooded in 1943. We went down to try to help the people. Do you recall that?

But from a health angle the waters of the State are the most important of all natural resources and their conservation and protection is vital to the public health and economic development.

With the per capita use of water increasing at the rate of 1 to 4 gallons per year, and with the population increases of urban areas now being experienced in this State, a most serious problem is presented in that our present public supplies will be unable to meet future demands. Therefore, in order to adequately serve the ever-increasing dependent population and industries, it is necessary that water supplies of acceptable quality for maximum beneficial uses be expanded.

From my statement that you will receive I just have two or three excerpts that I would like to bring to your attention.

The CHAIRMAN. The entire statement, Grady, will be made part of the record.

(The statement referred to follows:)

STATEMENT BY G. F. MATHEWS, M.D., COMMISSIONER OF HEALTH OF OKLAHOMA, AND HENDON M. CRANE, SENIOR SANITARY ENGINEER

WATER QUALITY MANAGEMENT

The waters of the State are the most important of all natural resources and their conservation and protection is vital to the public health and economic development. With the per capita use of water increasing at the rate of 1 to 4 gallons per year, and with the population increases of urban areas now being experienced in this State, a most serious problem is presented in that our present public supplies will be unable to meet future demands. Therefore, in order to adequately serve the ever-increasing dependent population and industries, it is necessary that water supplies of acceptable quality for maximum beneficial uses be expanded.

For Oklahoma and this Southwest area in general to contribute maximum productivity to the national economy, it is imperative that water resources be fully developed and most effectively utilized. In Oklahoma it has been our experience that more and more communities are finding it necessary to turn from inadequate local ground water sources to the exploration and development of surface water supplies.

We feel that each watershed must receive ultimate development, both as to upstream conservation projects and multipurpose reservoirs. We feel that all future multipurpose reservoirs should encompass all possible water uses, especially probable domestic water supply needs of cities and towns in the area.

The availability of water for dilution of treated wastes is essential in water pollution control. In this connection it is recommended that reservoir management practice be subject to periodic review relative to uniform water releases necessary to maintain downstream flows at levels which would provide reasonable stream recovery rates to meet the beneficial needs of downstream water users.

The planning necessary to accomplish these objectives must of necessity be a Federal-State effort, and we would recommend that the Public Health Service be authorized to expand water supply programs in planning for the development and use of water resources.

Coupled with the demand for more water is the plea for better quality water. A major quality problem in Oklahoma is the mineralization of our waters from natural and manmade sources. The manmade sources can be controlled, although there are serious gaps in the technical knowledge necessary to do this. The Arkansas-Red River Basins water quality conservation project of the Public Health Service, if carried on to completion, should offer valuable suggestions for the alleviation of the effects of natural pollution.

Thousands of tons of salt are added annually to Oklahoma streams in both the Red River Basin and the Arkansas River Basin due to natural pollution from salt springs and mineral deposits which seriously limits productive uses of available water. This pollution not only affects Oklahoma but limits downstream users in receiving States.

We thus heartily endorse the basic data accumulation programs currently conducted by the Public Health Service Arkansas-Red River Basins water quality conservation project and that of the U.S. Geological Survey Water Quality Branch, and urge that these programs be maintained at maximum productive levels and that these programs be followed at the earliest possible date by authorization of engineering feasibility studies to determine methods and means by which this type of pollution can be restricted or controlled to provide maximum utilization of available water resources.

For maximum utilization of available sources, it is also necessary that the degree of organic pollution control be maintained at the highest practical level consistent with good water quality management practices. In this respect Public Law 660 has aided materially in the reduction of pollution of State water supplies from domestic sewage by stimulation of sewage treatment plant construction. For example, since initiation of this program, cities and towns in Oklahoma have expended local funds in the amount of $9,861,298 for construction of sewage treatment systems, compared to $2,940,368 Federal participation.

It is thus important to the national economy in the conservation of our water resources that a program conducive to pollution abatement, such as Public Law 660, continue to receive Federal participation both from the standpoint of stimulating sewage treatment and plant construction and assistance to State water pollution control agencies in the maintenance of an adequate level of activity to insure continued progress. Therefore, we strongly urge that the

aid being offered to municipalities for construction of sewage treatment works be continued in at least its present level. We also recommend that the provisions of section 5 of the Water Pollution Control Act be extended during the next session of Congress. The grant funds under this section for State water pollution control agencies have enabled the Oklahoma State Department of Health to develop an expanded water pollution control program and to cooperate with the Federal Government on joint Federal-State pollution control problems.

In urging continuation of Federal grants, I want to emphasize that pollution control is not the type of problem that can be written off as finished at any one particular time. Population is continually becoming more concentrated. Industrial expansion in cities and towns not only increases the water supply needs but adds additional load to sewage treatment facilities along with increased population load. It has been our experience that sewage treatment facilities may be considered adequate to meet the need at a particular time, but this condition can change almost overnight due either to increased demand on the facilities or the need of downstream users of the receiving stream for water of a higher quality.

There are gaps in our technical knowledge which must be filled if we are to keep abreast of our ever-increasing population and industrial expansion.

The past several years have seen the development of many new chemicals which find their way into our water supplies. These range from the various synthetic detergents used by the housewife to agricultural pesticides and insecticides used in the production of the Nation's food supply. Added to this are chemical wastes hitherto unencountered from new industrial developments and radioactive wastes.

The toxicity of many of these substances has not been established. All represent potential water pollution problems which are not susceptible to conventional waste treatment methods.

In view of anticipated population growth and accompanying industrial expansion, the use and reuse of available water supplies becomes a "must." We therefore feel that it is most important that research be stimulated in the area of water supply and conservation and waste treatment.

The CHAIRMAN. I want to say I am delighted that you have given it.

Dr. MATHEWS. Yes.

Looking through this, I think there are some things that the Senators could help us with.

There has been a great deal of help, and I think you would like to know what has been done in Oklahoma relative to this Public Law 660.

The CHAIRMAN. You will be interested to know, Dr. Mathews, that Senator Case from South Dakota was one of the prime movers in the enactment of Public Law 660. It came through our Public Works Committee and the fine job has been done in the House, and the bill was rewritten as it now is by the Public Works Committee.

I would like you to know the part Senator Case played in that project.

Dr. MATHEWS. The use of this Federal grant has added materially in the reduction of the pollution of the State and water supplies and domestic sewage and has been a stimulation of sewage treatment plants construction.

It is interesting to know that 59 cities of all sizes have availed themselves in Oklahoma of this Federal grant working through our office.

As we see an improvement from the disposal of sewage and waste I can see a drop in the diarrhea and dysentery that was high in our past summers over the years. I think it has an effect to some extent very favorably comparative to the Hill-Burton program because you are reducing the rate of disease and mortality.

For example, since the initiation of this program cities and towns in Oklahoma have extended local funds to the amount of $9,861,000 for construction of sewage treatment systems compared to $2,940,000 Federal participation. It shows that the people of Oklahoma want to do all they can do to build up the safety measures for the city's disposal plant.

Senator CASE. Dr. Mathews, at this point could I ask you whether or not the limitation in the percentage of funds to be contributed by the Federal Government is a satisfactory figure or has it hampered what you would call a proper antipollution program.

Dr. MATHEWS. Senator, I think it is satisfactory on this present ratio of little cities, ones that have been built, little towns, with the sewage disposal, septic tanks outdoors—it has been a great pleasure to see some of these little cities benefit. We want to vote bond issues and get some Federal money so they can have a safe disposal of sewage.

Senator CASE. Has the limitation of the maximum amount that can be contributed to any municipality seriously affected the situation in Oklahoma?

Dr. MATHEWS. Senator, I do not know directly. I have my engineer here. Could you answer that, Mr. Crane? Did you get the question?

Mr. CRANE. So far, Senator, there has been no limitation on the maximum.

Senator CASE. I am glad to have that in the record because there have been proposals to increase the percentage of Federal contribution and also to increase the maximum amount that might go to any community.

Mr. CRANE. Yes, sir.

Senator CASE. But in the launching of this program it was felt by the committee at the time when Senator Kerr and I were working on it in conference that we would certainly take care of the most urgent cases and make the money go farther if we placed some limits.

Mr. CRANE. As far as Oklahoma is concerned, Senator, it has been just right for us.

Senator CASE. Thank you.

Dr. MATHEWS. One more point I wish to make here is that Public Law 660 has had the effect of stimulating plant construction, and has assisted State water pollution control and State agencies in the maintenance of an adequate level of activity and has insured continued progress. Therefore, we strongly urge that the aid being offered to municipalities for construction of sewage treatment works be continued in at least its present level.

We also recommend—and this is pretty important—that provisions of section 5 of the Water Pollution Control Act be extended during the next session of Congress.

That is my recommendation and my statement.

I appreciate coming before you and sitting in front of some very fine gentlemen. Thank you very much.

Senator MOSS. Thank you, Dr. Mathews.

Dr. MATHEWS. That is my speech.

Dr. REID. Thank you very much, Dr. Mathews.

We have one more from this group. That is Dr. Nelson Peach, a graduate of Johns Hopkins University who has been at the University of Oklahoma for about 9 years. He has written five texts and is becoming an expert on economics and water resources.

Dr. Peach.

STATEMENT OF DR. W. NELSON PEACH, CONSULTANT, BUREAU OF WATER RESOURCES RESEARCH, UNIVERSITY OF OKLAHOMA

Dr. PEACH. Senator Kerr and members of the committee, my name is W. N. Peach. I am a professor of economics and chairman of the Department of Economics at the University of Oklahoma.

My special field of interest is national income and resources. For the past year and a half I have been a consultant with the Bureau of Water Resources Research on economic and population studies.

During the period 1950–60 the Federal Government has appropriated a little less than $900 million per annum. Except for a sharp drop in 1954 and a somewhat more than comparable increase the following year, there has been a fairly steady increase in these appropriations over the past decade.

During the period under consideration total Federal appropriations have amounted to about $750 billion. Civil works appropriations have accounted for 1.2 percent of the total. These appropriations amounted to 1.5 percent of the total in 1950 and the same percentage for the current fiscal year, ending June 30, 1960. If appropriations for the fiscal years 1954 and 1955 are averaged, civil works appropriations have shown little variation over the 10-year period, viewed as a percent of the total Federal budget.

During the period 1950–60—with estimates for part of 1959 and all of 1960—our gross national product amounted to $4.5 trillion.

Civil works appropriations amounted to 0.2 percent—two-tenths of 1 percent—of gross national product. Except for 1954 and 1955, the percentage showed a little variation over the entire period.

Although honest men have sincere differences of opinion on the subject, it seems to me inevitable in our social and economic environment that the Federal Government must continue its historic role in contributing to the development of the Nation's water resources.

If this is a reasonable assumption, my suggestion may be stated in the form of a question: Would it be desirable to begin congressional consideration of civil works appropriations as a given percent of the Federal budget or as a given percent of the gross national product?

The fiscal year—or calendar year—might be either the year under consideration or the next preceding for year for which data are available. For example, civil works appropriations might be 1.2 percent of the Federal budget, or they might be 1.5 percent, or 10 percent, or any fixed percentage determined by the Congress.

My personal preference would be for a much larger percentage.

As I see it, the advantage of such an approach would be that if the approximate total was readily determined, the Congress could spend its time choosing among alternative projects which had been brought before it. It seems to me that over the next two decades it will be desirable to bring about some semblance of national balance in the development of the Nation's water resources.

The suggested method is based on the evolution of established congressional policy. Although it is arbitrary to a certain extent, it may provide a useful rule of thumb for determining total appropriations. Such rules of thumb have been used widely in congressional budgeting and policy determination.

For example, the concept of feasibility with respect to water projects is arbitrary to an extent. The benefit-cost ratio might be defended on the basis of one-half to 1, or 2 to 1 almost as rationally as the present 1-to-1 ratio.

Another example is that interest payments on the Federal debt are a fixed charge, although the amount of interest paid varies from year to year. As a final example, the interest rate paid by the Treasury on a number of trust funds managed by Federal agencies is the average rate paid on all Treasury debt during a previous quarter of a calendar year.

If the suggested criterion is acceptable, provision might be made to decrease spending on civil works during time of war or to increase spending on civil works during periods of spreading unemployment.

Attached to this statement are suggestions by my colleague, Professor Reid, for determining the priority of various projects under consideration.

In addition to the conventional benefit-cost studies of water resource projects, Professor Reid and Colonel Wilson suggest the Federal Government could well utilize a criteria that would delineate the worth of a particular project or projects in a system to the country as a whole to assist in the internal allocation of public works funds from State to State.

Two criteria suggest themselves, one would be to ascertain the relative degree of total water resource potential completed as compared to other areas. This can be easily accomplished by appraising the total conservation storage in terms of some appropriate fraction of the mean annual runoff reduced to virgin conditions.

For example, on the Arkansas system at Pine Bluff there is at present an accumulation for the upstream system of 8,540,000 acre-feet of conservation storage. A river system of this type in this area of great variations the fraction of the mean annual flow would be several times greater than one indicating a storage of 50 million acre-feet.

That is to say, the Arkansas system is only 16 percent completed. This could be compared to another system, for example, in the Missouri system where there is approximately a conservation storage of 47 million acre-feet with a mean annual discharge of approximately 58,000 acre-feet per year at Hermann, Mo. In terms of percent development this would be roughly 50 percent by comparison.

Secondly, one might concern oneself in terms of worth to the rest of the Nation, as a function of the area's capability to support population with the development of water resources. It is noted that in 1950 the national population density was 51 per square mile and the 12–13 Eastern well-watered States averaged 75.9, with the most densely populated being Rhode Island with 749.

An analysis of RFF projects for the year 2000 now shows Rhode Island with 1,730 and seven States with densities in excess of 600. For the same periods, Oklahoma had 32 and 54 respectively. Obvi-

ously with water resource development, States like Oklahoma can benefit the Nation considerably by equalizing the population densities.

Thank you.

The CHAIRMAN. Thank you, Dr. Peach.

Dr. REID. In the interest of getting ahead, I will just submit our other suggestions, in writing, to you.

The CHAIRMAN. Thank you very much, Dr. Reid.

We would be very glad to have them.

The high quality of what we have had indicates they have been a worthwhile contribution.

(The information referred to follows:)

STATEMENT BY GEORGE W. REID, DIRECTOR, BUREAU OF WATER RESOURCES RESEARCH, UNIVERSITY OF OKLAHOMA, NORMAN, OKLA.

Gentlemen, my name is George W. Reid. I am professor and chairman of the School of Civil Engineering at the University of Oklahoma, and director of the Bureau of Water Resources Research. The bureau is an organized research effort of the university which makes possible the studies on water resources development, utilizing the team action of the various specialists at the university and the Oklahoma State University.

Though I am a Hoosier and a graduate of Purdue University, I have received training at Harvard University and Johns Hopkins University.

Residing in Oklahoma for the past 10 years, I have become deeply interested in her water resources and water quality management problems. As a result, my activities in this area include contributions to the Governor's water pollution technical committee, consultant to the Oklahoma State Water Resource Board, the U.S. Air Force, and the U.S. Public Health Service. I have participated in the development of a water quality criteria for Oklahoma and in the development of estimates of future water requirements for the State.

At present, the bureau of water resources research is working on various projects; among those completed are the computation of estimates for numerous cities and counties for the State water board and the project HOW committees. These estimates are being used for purposes of compacting and planning for the central Oklahoma canal.

Both the future population and the future water requirements for the State have been published and reprints are being furnished the committee. They are as follows: 1. "Future Population Estimates for the State of Oklahoma," ASCE, paper No. 1136, January 1957; 2. "Future Water Requirements for the State of Oklahoma," JAWWA, November 1959.

Future water requirements for the State of Oklahoma have been determined for years 1975, 2000, and 2025. These requirements were arrived at by reference to performance of well-watered areas with the assumption that if Oklahoma were to receive adequate water it would grow as well-watered areas have grown and continue to grow. Oklahoma's growth through migration and resulting catalytic growths appears to hinge on water resources; consequently, these estimates, or talking figures should be used only as guidelines.

Future water requirements are the product of the estimated future population and the total per capita use of water.

Population estimates for the State of Oklahoma were determined first by projecting the population of the United States and assuming no migration in or out of the continental area. And secondly, by assuming that some already saturated areas of the United States are unlikely to continue to accommodate continuous rapid increases and that migration is likely to occur to less populous areas capable of more dense, urbanized development. Oklahoma's share of the national increase was weighted by three factors, designed to reflect growth on the assumption of a major increase in available water resources. These factors are a comparison of urban growth rate, urbanization, and population density in well-watered areas to those of Oklahoma. On the basis of these calculations, the indicated values for the population of Oklahoma were 2,890,000 in 1975, 4,500,000 in 2000; and 5,380,000 in 2025.

The three categories of water use employed by the State of Oklahoma are municipal, direct industrial, and agricultural.

Municipal use includes the water used domestically, industrially, publicly, and commercially. Also included are losses incurred in getting the water to the consumer. At present there are 388 municipalities with individual water supplies in Oklahoma, 76.9 percent of which are ground-water supplies.

Following the basic theme of the population studies, namely: That with adequate water, Oklahoma could grow as well-watered areas have grown and continue to grow, the problem then was to make the per capita consumption comparable to those of well-watered area and, at the same time to provide for the increased water requirements resulting from the general upgrading of the standard of living.

The per capita values were first determined for the years 1975, 2000 and 2025; there were: 148, 185, and 235 gallons per capita per day (gcd) respectively. The per capita consumption for Oklahoma in 1950 was 81 gcd, and 103 gcd in 1955.

The total municipal requirements were computed as the product of these values and their corresponding population estimates: the 1975, 2000, and 2025 figures are 0.490, 0.945, and 144 million acre-feet per year, respectively.

It is envisioned that industrial development in Oklahoma will acquire a greater percentage of its water from municipal sources than is expected nationally. In other words, these estimates may be low because it is believed that much of the industrial development will be of the type requiring no direct industrial water. Nationally, the direct industrial water requirement is approximately seven times the total municipal requirement. In Oklahoma the direct industrial requirement is predicted to be less than the municipal requirement in 1975 and 1.1 times the municipal requirement in 2025.

In computing the industrial futures, consideration was given to the adoption of conservation practices in new industrial development. Also it is hoped that industrial development will be programed to prohibit the development of wasteful users and permit the utilization of multiple use of water from industry to industry.

The industrial water requirements were computed to gradually reach what would be considered basically the process water requirement with a modest cooling requirement insisting on full conservation practice, programed use, and reuse as well as industrial development with the exclusion of excessive water consumers. Using the preceding criteria, with full development in year 2025, it is estimated that this ratio would increase to 1.1. The future direct industrial water requirements would be 0.290, 1.300, and 2.00 million acre-feet per year for years 1975, 2000, and 2025, respectively.

Approximately 300,000 agricultural acres are being irrigated at the present in Oklahoma. Taking such factors as suitability of the land, flooding hazards and inadequate drainage, it is estimated that 2,012,000 acres are suitable for irrigation.

Applying a consumptive use of 2.3 feet per year, this is envisioning intensive irrigation and using high value crops, and an ultimate of 660,000 acres of land a future requirement in year 2025 of 1.272 million acre-feet per year, is arrived at. Years 2000 and 1975 would have 0.950 and 0.400 million acre-feet per year, respectively.

The total water consumption has been doubling every 25 years, or increasing at the rate of 3 to 4 gallons per capita per year. The total future requirements were computed by summarizing the component parts—namely, municipal, agricultural, and direct industrial requirements. They are estimated to be in years 1975, 2000, and 2025, respectively, 1.4, 3.67, and 5.21 million acre-feet per year.

And finally, it would be remiss not to point out that these are "talking figures" not estimates and should be treated as guidelines only. Greater refinement would require much, much more knowledge of the consumption of water; in other words, in addition to the continuance and expansion of the collection of basic data on natural water-producing phenomena, should be added careful collection of water demand data, exploring deeply as has never been done in the past into the eventual depletion of supplied water. These data should provide the tools to project with reasonable accuracy the requirements of the future.

The CHAIRMAN. I will introduce Col. Francis Wilson who will take over the next program.

STATEMENT OF FRANCIS J. WILSON, EXECUTIVE VICE PRESIDENT, ARKANSAS BASIN DEVELOPMENT ASSOCIATION, INC.

Colonel WILSON. Senator Kerr and the other distinguished members of the select committee, Senator Monroney, ladies and gentlemen, it is an honor for me to appear before this distinguished group and to have the task of moderating this third category.

I have the honor of being the executive vice president of the Arkansas Basin Development Association.

The CHAIRMAN. May I interrupt, Colonel?

Colonel WILSON. Yes, sir.

The CHAIRMAN. You not only have the honor of moderating, but you have the responsibility of accelerating it.

Colonel WILSON. I will do my very best, Senator Kerr.

This association is very active throughout the Arkansas Basin. It has been instrumental in developing what we call our tristate committee.

This committee represents the States of Kansas, Arkansas, and Oklahoma, in presenting the testimony before the Congress and unites this entire basin. We have many smaller organizations that are affiliated with the Arkansas Basin Development Association and we will hear from several of these this morning.

The association has prepared a statement which we ask permission to file with this committee.

I have already turned it over to the staff man.

(The statement referred to follows:)

STATEMENT BY COL. FRANCIS J. WILSON, U.S. ARMY, RETIRED, EXECUTIVE VICE PRESIDENT OF THE ARKANSAS BASIN DEVELOPMENT ASSOCIATION, INC.

Gentlemen, my name is Francis J. Wilson. I am a consulting engineer and hold the office of executive vice president of the Arkansas Basin Development Association. I served in the Corps of Engineers of the U.S. Army from 1922 to 1946, and at the time of my retirement I was district engineer of the Tulsa district. I participated in studies of practically every stream in southern Kansas, Oklahoma, and northern Texas. The Arkansas Basin Development Association includes in its membership the Neosho-Cottonwood Flood Control Association, the Verdigris Valley Conservation and Flood Control Association, the Walnut-Arkansas Valley Flood Control Association, Kaw Dam and Reservoir Association, the Oklahoma Water Development Foundation, the Eufaula Dam Association, and the majority of the chambers of commerce in cities of the area.

I appear here as the representative of this organization of Arkansas, Kansas, and Oklahoma businessmen which was established in 1945 to further the purposes implied by our name: The Arkansas Basin Development Association, Inc.

The members of our association are convinced that here in the Arkansas Basin we have all the ingredients necessary for a development which one day will be the equal of any the world has ever known, comparing favorably with the Ruhr Valley and the Ohio Valley.

We have great deposits of the basic energy fuels—oil, gas, and coal. We have probably the largest supply of uncommitted, unharnessed high-quality water to be found anywhere in the Nation. Within easy reach of a navigable Arkansas there are 65 commercially producible minerals. Of the 38 minerals which are in short supply in the United States, 30 are found in the Arkansas Valley. For a detailed study of these mineral resources, we refer you to the Arkansas-Red-White Interagency Committee report completed in 1955 (S. Doc. No. 13, 85th Cong., 1st sess.).

The Arkansas River navigation project now under construction and scheduled for completion in 1972 will provide the low-cost year-round water transportation which will link our great storehouse of virtually undeveloped resources with the markets of the world and permit producers of the Nation to reach a growing region heretofore closed to them by high freight rates.

In recent years, Oklahoma and the landlocked portions of New Mexico, Colorado, Kansas, Arkansas, and Missouri, which are also part of this basin, have enjoyed little or no gain in population while as you know the Nation as a whole was growing at the rate of 3 million persons a year.

We have been undergoing a transition in which industry has taken the place of agriculture as the great basic force in our economy. While the rural farm and ranch areas were losing population, the urban industrial areas were gaining. It is probable that the reduction in rural population has about run its course, and that as the urban industrial population continues to grow, this area will show a definite gain during the decade 1960–70.

During the decade 1970–80, the completion of the Arkansas navigation project, coupled with the increasing congestion of the eastern part of the United States will force a population overflow into this region of explosive proportions.

By 1980, it is not unreasonable to expect that Arkansas and Oklahoma will each be a State of 4 to 5 million population and growing at a feverish rate and it will be well for America that it has such an outlet in the Arkansas Basin.

The characteristics of the Arkansas River change greatly from the point where it rises on the Continental Divide near Leadville, Colo., at an elevation of about 11,500 feet to the point where it joins the Mississippi River in southeastern Arkansas at an elevation of about 106 feet.

As a matter of fact, the river, which is 1,450 miles long, may be considered as consisting of three principal reaches:

The first is the upper snow-fed reach, which falls from the high mountains more than 100 feet per mile near the source. The second is through the dry high plains and is largely dependent on rains for its highly variable flows. Runoff has a high sediment content and is highly mineralized. The third reach carries greater and more dependable flows and flattens out near the confluence of the Verdigris, Grand, and Arkansas Rivers near Muskogee, Okla. Below Muskogee, the Arkansas flows through an alluvial valley with slopes generally of about 9 inches per mile.

At Canon City, Colo., the drainage area is a little over 3,000 square miles and there is an average flow of 725 cubic feet per second with a minimum flow of 82 cubic feet per second. At Garden City, Kans., the drainage is nine times as much but the average flow is only one-third as great and zero flows are experienced. By the time the river reaches Tulsa, where there are 74,300 square miles of drainage area, the average flow has built up to 6,460 cubic feet per second.

From Tulsa on down there are material increases in flow not only because of the larger watershed but because of greater yield per square mile of drainage area. At Van Buren, Ark., the drainage area is a little over 150,000 square miles, about twice that at Tulsa, yet the average flow of 32,820 cubic feet per second is five times as great. The increase in drainage area between Van Buren and Little Rock is only 5 percent but the average flow increases 32 percent to 43,370 cubic feet per second.

The basin is shaped something like a bottle with the narrow neck extending across the State of Arkansas. Maximum recorded discharges build up as we come downstream until we reach Van Buren—which is virtually on the Oklahoma-Arkansas line—and tend to decrease thereafter.

At Canon City the maximum recorded discharge was 19,000 cubic feet per second. At Garden City, 33,500. At Tulsa, 250,000 cubic feet per second. At Van Buren, 850,000 cubic feet per second. At Little Rock, 536,000 cubic feet per second.

FLOOD CONTROL

Flood control has necessarily been the first step in harnessing the runoff waters of the Arkansas basin for useful purposes. In this field we have made much progress.

The Army Engineers reported a few days ago that 13 reservoirs (all but 2 of which are in the Arkansas basin) and 7 local protection projects which have been completed in the Tulsa district during the past 20 years at a cost of $275 million have prevented nearly $97 million in flood losses.

When it is noted that part of the Government's investment in these projects was for power and irrigation, and when it is remembered that the average age of the reservoirs is but little over 10 years, the great value of these improvements is readily appreciated.

Following the floods in the Arkansas basin last month, the district engineer at Tulsa estimated that, had there been no flood-protection works, damages on the Arkansas River and its major tributaries would have amounted to $37 million.

The district engineer estimated that existing projects had prevented $12 million of these potential damages, and had projects now under construction been completed, the damages would have been cut another $11 million.

The difference between the $12 million in damages prevented, the $11 million in damages which will be prevented, and the $37 million in damages which would have occurred had there been no protective works is a measure of the flood-control job which is still before us in the areas affected by the October floods.

The Keystone Reservoir now under construction would have prevented flooding which forced evacuation of many homes in and near Tulsa and did extensive damage to valuable farmland and Federal, State, and county highways.

Additional projects are needed to protect Guthrie, Stillwater, and Pawnee—all of which are upstream from Keystone—and in which hundreds of homes were flooded. We think a review of earlier reports on the Cimarron is needed and that projects proposed for this stream could produce enough benefits for justification.

Bird Creek rose 3.8 feet above its previous high water mark on the north edge of Tulsa, forcing the evacuation of hundreds of persons in Skiatook and Sperry, highlighting once again the need for flood-control projects on Bird, Hominy, Sand, and Little Caney Creeks, all of which empty into the Verdigris River below the Oologah and Hulah Dams. Current studies should be expedited.

Brazil Creek, which empties into the Poteau River below the Wister Dam, Shidler Creek, the Salt Fork of the Arkansas, the Chikaskia, and the Walnut, a tributary of the Arkansas in southern Kansas, are other perennial troublemakers. Okmulgee has had to evacuate a considerable number of residents twice in the past 3 years.

In some cases, upstream flood control projects of the Department of Agriculture may prove to be the most economical way to obtain a reasonable degree of flood protection. In others, it is probable that the larger structures built by the Army Engineers will be required.

Additional flood control storage space is needed on the Verdigris and Grand (Neosho) Rivers in Kansas and on Spring River in Missouri. In regard to the Grand (Neosho) in Kansas, it may be of interest to the committee to note that there is a distance of 200 miles between the presently authorized reservoirs in central Kansas and the headwaters of the Pensacola Reservoir in northern Oklahoma.

We have assumed that the select committee's interest is in determining the needs of the various parts of the Nation, leaving solutions to the regular agencies of the Government and committees of the Congress.

WATER SUPPLY FOR OKLAHOMA'S PRINCIPAL CITIES

The struggle for water has provided many colorful chapters in the history of Oklahoma's two principal cities.

It has only been 35 or 36 years since the water from the faucets of Tulsa homes was often a deep, rich chocolate in color, and not much more than 20 years ago that the headlines in Oklahoma City's newspapers declared: "Without water this city cannot grow."

Today, each of Oklahoma's two largest cities has an adequate water supply for domestic requirements and each plans for expansion to meet the needs of the population growth expected by 1980 but, except for the Oologah supply mentioned below, neither can offer low-cost water of good quality to industry now.

The city of Tulsa has contracted for space in the Oologah Reservoir which will yield 38 million gallons of water daily beginning in 1962. The city plans to offer this excellent water to industry.

At the direction of the Congress, the Corps of Engineers is studying the central Oklahoma project which contemplates transporting more than a billion gallons of water a day from the mountains in the southeastern part of the State to the Oklahoma City area.

Preliminary examinations indicates this project will make the finest quality water to be found anywhere available to central Oklahoma in large volumes at a cost acceptable to industry and will make feasible a barge canal connecting with the Arkansas navigation project.

The streams from which the water would come empty into the Red River downstream from the Denison Dam and periodically cause extensive flood damage in southern Arkansas and in Louisiana.

Not only are they uncontrolled instruments of destruction, but they are located in an undeveloped, richly endowed region which has every asset to be found in the Tennessee Valley and many others besides.

We who live and pay taxes in other parts of Oklahoma have a selfish interest in seeing this southeastern region, rich in rainfall, rich in timber, rich in coal, developed to its full potential because today it is a have-not area and an unnecessary burden upon State and Nation.

The canal through which it is proposed to transport water to central Oklahoma would pass through a 60-square-mile area which geologists regard as possessing a larger concentration of a wide variety of minerals than are to be found in a similar area anywhere in the world. This project will be discussed in detail by Mr. Guy B. Treat.

The proposed Kaw Reservoir on the Arkansas River just south of the Kansas-Oklahoma line will increase the life and usefulness of the Keystone Reservoir, will add valuable flood control space on the Arkansas, and will supply the water needed to support a great population and industrial development on the fertile plains of the Ponca City area. Given the added ingredient of low-cost water, the fabulous oilfields of this part of Oklahoma offer opportunity for extensive petrochemical development.

POLLUTION

The fine work which has been done by the State of Kansas in the elimination of man-made pollution provides us with an excellent example of how waters now unusable may be added to our future usable water supply.

Upstream dam construction has eliminated some of the suspended solids which made the Arkansas River of little value for domestic or industrial use. Recent studies have indicated that other areas of natural mineral pollution may be isolated so as not to contaminate our major streams, pointing the way to making the Arkansas and perhaps the Canadian more than mere giant sewer systems. We believe that there will be much benefit for future generations if it is made possible for the Public Health Service to expand current studies and research in these fields.

ECONOMICS

If the Department of Commerce's Business and Defense Service Administration was correct when it estimated the United States will have to spend $171 billion to meet the Nation's water development needs by 1975, expenditures will have to average above $11 billion a year for the next 15 years. This, of course, would be 10 times the present annual Federal investment in water resource development, and includes the share paid by local interests. Currently, the Federal budget allows about one-fourth of 1 percent of our national income for water development.

In the light of the backlog of worthwhile projects which have already been authorized and engineered, it would be logical as a first step to double our annual investment in water resource development—in other words, to increase Federal appropriations to at least one-half of 1 percent of the national income. Professor Reid will have more to say on this point.

In the Arkansas Valley such a move would make money for the Nation.

An important saving can result from speeding up construction of the Arkansas navigation project. Based on 1949 traffic studies, the navigation benefits are figured at $40.5 million annually and the total benefits at about $64 million annually. If the completion date could be advanced 2 years, the benefits would be equal to 10 percent of the construction costs. With interest costs rising constantly, the savings in money cost alone becomes significant.

Bank stabilization is one phase of the Arkansas navigation project which can be accelerated immediately and result in reduced construction costs later on. Once the bank stabilization work has been completed, the river itself will do much toward improving the navigation channel. In a few years it will sharply reduce the amount of material remaining to be removed by dredging and could reduce the number of structures required.

Installation of a lock in the Eufaula Dam which is now under construction so as to provide a connection between the Arkansas-Verdigris navigation channel and the central Oklahoma project should be less expensive than having to build one later after the Eufaula Reservoir has filled. This could also open to low-cost water transportation, the high-quality coal reserves in this area and its pioneer glass industry.

Still another field for consideration is recreation.

The same reservoirs which were mentioned in the flood control section of this statement as having played a key role in preventing nearly $97 million in flood losses since they were completed have an annual attendance of 17.5 million visitors. Various estimates have been placed on the amount of money vacationers spend. If the visitors to the reservoirs of the Tulsa district spend an average of only 60 cents a day each, they are worth as much to the local economy as the flood control benefits. Since many persons spend $10 to $30 a day on vacations, it is probable that visitors can be valued at $1.50 per day on the average. And on this basis, reservoir projects have a value to the communities of which they are a part for recreation alone which is 2½ times their value for preventing floods.

Flow of streams in this general area is such that in some cases the development of hydropower has appeared marginal. We firmly believe, however, that all possible development of hydroelectrical power should be given careful consideration since with the rapid expansion of thermal-generating facilities the hydropower which can be developed will have greatly increased value for peaking purposes. Markham Ferry Dam is an example and it is only a question of time until installation of hydro units at Keystone will be more than justified.

It has been an honor to appear before your distinguished committee. We feel there is no more important work than the careful planning for the future development of our water resources.

Colonel WILSON. We do have a very brief summary, and I am going to call on Mr. G. R. Kirkpatrick, vice chairman of the board of the Arkansas Basin Development Association, to present this brief summary for your consideration.

Mr. Kirkpatrick?

STATEMENT OF G. R. KIRKPATRICK, VICE CHAIRMAN, ARKANSAS BASIN DEVELOPMENT ASSOCIATION, INC.

Mr. KIRKPATRICK. Senator Kerr and honorable members of the committee, the Arkansas River multiple-purpose project now under construction by the Corps of Engineers, which is scheduled for completion in 1972, will provide a 9-foot year around navigation channel for the last major tributary of the Mississippi River.

When this project is completed, it will be possible for barges to ascend the Arkansas and Verdigris Rivers from the Mississippi River to the vicinity of Tulsa. The 500 miles of river which will be added to the Nation's inland waterways runs through a region which is rich in coal, gas, and oil, and has a great variety of other minerals.

Completion of the Arkansas project places another great pillar in support of the economy of our Nation. If this project could be speeded up the contribution it will make to the national economy could be available perhaps as much as 2 years sooner than is now anticipated.

Furthermore, there could be important savings in construction costs and interest payments which are not to be ignored in the light of the water development which is going to be necessary if America is to provide for the rapid increase in population which is expected. We think it is also important and not to be forgotten that if the United States is to maintain world leadership it must seize every opportunity for natural resources development. This is the only way we can keep pace with the vast public works being undertaken in the Soviet Union and in China.

Students of population growth are now saying that during the next 40 years, the population of the United States will double. Homes for 350 million Americans can hardly be provided on this continent without a great influx into a valley as richly endowed as the Arkansas.

Water supplies will dictate how far up the valley this migration is able to advance. Although 37 million acre-feet of water flows out of Oklahoma in an average year, the lack of controlled water has been a limiting factor in Oklahoma since the days when this area was first opened to settlement.

The reservoirs, which are a part of the Arkansas project, promise to provide the water supply which eastern and northeastern Oklahoma will need up until 1980—the period which this committee has chosen to study.

Additional provisions need to be made, however, for southeastern, central, and northern Oklahoma.

Oklahoma's heaviest annual rainfall is measured in the southwestern part of the State, and the runoff there in a normal year is 40 times the runoff in the western part of the State.

Through what is called the central Oklahoma project, it is proposed to transport more than a billion gallons a day of the fine water found in the mountains of southeast Oklahoma into the cities of central Oklahoma.

For part of its journey, this canal can be used to float barges as well as for water supply and in conjunction with the Eufaula Reservoir, now under construction, can make it possible for Oklahoma City to have a barge connection with the Arkansas and Mississippi Rivers.

The great wealth of natural resources in the central and southeastern Oklahoma and in western and southwestern Arkansas makes the central Oklahoma project as challenging as the great work which has been done in the Tennessee Valley, along the St. Lawrence Seaway, as a result of the Boulder Dam, in the central valley of California.

We would call this committee's attention, too, to the need for additional water supply which can be provided by the proposed Kaw Dam on the Arkansas River east of Ponca City, and to the need for additional flood control works at a number of places in the Arkansas Valley.

Specifically, we have in mind, on the Grand (Neosho) River in Kansas, on the Walnut River system in Kansas, and the Cimarron River, Bird and Hominy Creeks near Tulsa, and on Brazil Creek near Poteau.

Not all of our runoff water in Oklahoma is presently usable but the strides which are being made in the battle against natural and man-made pollution could easily double the amount of consumable water available in Oklahoma.

We endorse the work the Public Health Service has done in this field and urge its continuation.

I thank you.

The CHAIRMAN. Thank you very much, Dave.

Senator CASE. Mr. Chairman?

The CHAIRMAN. Senator Case?

Senator CASE. Before you go further, I have just been scanning this statement by Colonel Wilson, which has been submitted for the record.

I would like to call attention to these two sentences where he deals with the recreation values of reservoirs, and I do this, I might say,

to our Oklahoma friends here, because Senator Kerr has been very much interested in the possibility of working throughout Federal legislature a recognition of the recreation values in reservoir construction.

Colonel Wilson, in his statement, says:

> Since many persons spend $10 to $30 a day on vacations, it is probable that visitors can be valued at $1.50 per day on the average.

Then he draws this very interesting conclusion:

> And on this basis, reservoir projects have a value to the communities of which they are a part for recreation alone which is 2½ times their value for preventing floods.

Most of our projects have been justified on the basis of their value for flood prevention and flood control. If it is correct that the recreation values have 2½ times the values for preventing floods, it will give a little support to our interest in getting recreation recognized as a factor in the measuring of the feasibility of the projects.

I think Colonel Wilson's statement should be emphasized for its interest on that point.

Colonel WILSON. Thank you so much, Senator Case.

We do feel that it is tremendously important, and unfortunately we have never been able to put a dollar sign on this thing before, until the distinguished gentleman on my left started to work on this.

The CHAIRMAN. I appreciate Senator Case's remarks on that point, and your statement, Colonel Wilson, because the Senator from South Dakota and I have been working together on that and have hoped to get title III in the Flood Control Act of 1960, directing the recognition of that economic value in the reports of the agencies to the Congress in connection with the justification of the projects.

Colonel WILSON. Thank you, Senator.

We have a very distinguished man here from Bartlesville, who cannot be here this afternoon, Mr. George Downs, chairman of the Water Resources Committee of the Chamber of Commerce of Bartlesville, Okla., one of our directors, and we will call on him for a very brief statement.

The CHAIRMAN. What is that name?

Colonel WILSON. George Downs, of Bartlesville.

He is scheduled to appear in another category, but he cannot be present this afternoon so I asked Mr. Downs to give his statement now.

The CHAIRMAN. Mr. Downs.

STATEMENT OF GEORGE DOWNS, CHAIRMAN, WATER RESOURCES COMMITTEE, BARTLESVILLE, OKLA.

Mr. DOWNS. Thank you, Colonel Wilson.

I appreciate being moved up on the program.

Senators Kerr, Moss, Hart, and Case, I am providing copies of the statement there, and on Senator Kerr's copy there is a little tag that will give a convenient conversion on water quantities which will be helpful in instances where you want to convert from acre-feet and so on.

This statement concerns the development of the Caney River Valley, a tributary of the Verdigris, which is a tributary of the Arkansas River.

It ties in with the multiple-purpose plan to a considerable degree which Mr. Kirkpatrick and Colonel Wilson of the Arkansas Basin Development Association described.

If you will refer to the map on the back I will summarize the statement and consequently accelerate the time.

With reference to flood control north of the Kansas line, watershed districts have already been formed in the big Caney watershed, middle, and north Caney watershed, Bee Creek watershed, and the Grant-Shanghai watershed.

These districts are supported by a high degree of interest in Kansas and that work should be accelerated to provide protection on downstream.

In Oklahoma south of the line upstream watershed work is now in progress and this should also be accelerated. There are some 80,000 acres shown by the shading on the map which are now only producing approximately 10 percent of their agricultural capacity because of the threat of floods.

The main-stem reservoir on Sand Creek, shown at the middle left of the map, is now under study by the Corps of Engineers. This should be constructed and will provide approximately 90-percent protection from floods below the dam to the Caney River and to the highly developed industrial districts of Bartlesville, Okla.

Studies have been made on a reservoir at Cohan, Okla. To date this multiple-purpose project has not been justified. It may be in the future that it will be.

Consequently, for flood control upstream, watershed in Kansas plus watershed work in Oklahoma plus San Creek and Copan Reservoirs are needed.

Water supply is being provided by Hulah Reservoir through the efforts of Senator Kerr and the Corps of Engineers to the city of Bartlesville. This will provide water until the year 1980. From the year 1980 until 2000 it is believed that additional water sources, we think Sand Creek, should be constructed. Irrigation is becoming increasingly important in the Caney Valley. This purpose for reservoirs should be kept in mind.

Pollution abatement is serious in the periods of drought in the summertime on the rivers and creeks in the Caney watershed.

Hulah Reservoir provides 7,100 acre-feet of storage for this purpose. This type of storage should be provided in other structures in the valley.

With reference to recreation, as brought out by Senator Case, 578,000 people visited Hulah Reservoir in 1958 and 443,000 people in 1959. On the basis of $30 per person per visit that would be $18 million in 1958. Those figures are Senator Case's, I believe.

The CHAIRMAN. A combination of Senator Case's and Colonel Wilson's.

Mr. DOWNS. Senator Case and Colonel Wilson.

The CHAIRMAN. Yes.

Mr. DOWNS. The statement covers our requirements in more detail. I have filed 25 copies.

Thank you very much, gentlemen.

The CHAIRMAN. Thank you very much.

You have given me here not only your letter but letters from other fine citizens of Bartlesville and that area, together with a copy of the map, and these will be inserted in the record.

(The information referred to follows:)

CANEY RIVER IN KANSAS AND OKLAHOMA
A TRIBUTARY OF THE VERDIGRIS RIVER
ARKANSAS RIVER BASIN

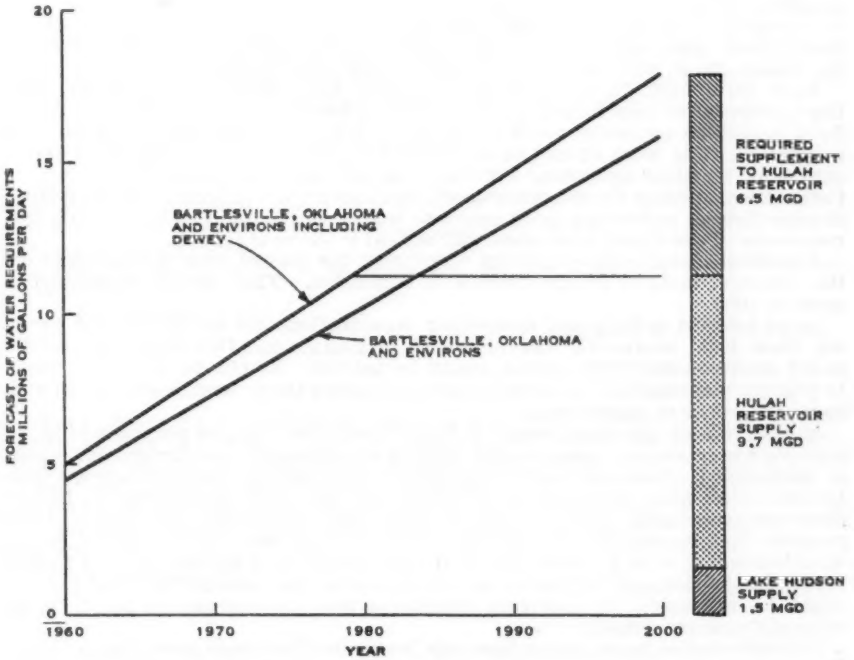
NEEDS FOR WATER RESOURCES DEVELOPMENT
1959-1980 AND 2000

PRESENTED TO UNITED STATES SENATE SELECT COMMITTEE FOR NATIONAL WATER RESOURCES HEARING AT OKLAHOMA CITY, NOV. 30, 1959

Chamber of Commerce
Bartlesville, Oklahoma

Water Resources Committee

FORECAST OF WATER REQUIREMENTS
MILLIONS OF GALLONS PER DAY



ESTIMATED WATER DEMAND & SUPPLY FOR BARTLESVILLE, OKLAHOMA AND ENVIRONS INCLUDING DEWEY, OKLAHOMA

Chamber of Commerce
Bartlesville, Oklahoma

Water Resources Committee

CHAMBER OF COMMERCE, INC.,
Bartlesville, Okla., November 24, 1959.

GENTLEMEN: The following statement is submitted by the Chamber of Commerce of Bartlesville, Okla., to outline the needs for water resources development in the Caney River Valley. The Caney River is a tributary of the Verdigris River which is a tributary of the Arkansas River. The attached map shows details of the river valley covered by this statement.

FLOOD CONTROL

Some 80,000 acres of rich alluvial bottomland (shown by shading) in the valley are producing only 10 percent of their potential because of threat of flood. Urban properties in the towns of Bartlesville and Dewey, Okla., are subject to flooding. The Hulah Reservoir on the Caney River, placed in operation in 1952, now provides partial relief from the flood threat. A main-stem reservoir on Sand Creek, plus upstream flood protection to supplement Hulah Reservoir on the Caney River, will provide substantial relief from the flood threat.

Four watershed districts—Grant-Shanghai, Bee, Middle-North Caney, and Big Caney—have been formed and approved in Kansas. Completion of upstream flood protection measures north of the State line will materially assist in flood prevention. The work should be accelerated in Kansas. In Oklahoma an application for planning assistance has been filed and approved at the State level on Cotton-Coon-Mission Creeks watershed; and application covering the Sand-Hogshooter Creeks watershed is in process; and a third application covering the remainder of the Caney watershed will be filed in the near future.

A watershed improvement district, covering the shaded area in Oklahoma on the attached map, is in the process of formation. This should be completed early in 1960.

Local interest is high and sponsoring organizations are in existence to carry out these flood prevention measures both in Kansas and Oklahoma. A coordinated plan covering both States would be helpful. Emphasis should be given to placing planning parties in the field to complete the economic evaluation and begin the works of improvement.

A reservoir on the main stem of Sand Creek for multiple purposes of flood control, water supply, conservation, pollution abatement, and irrigation, seems to be justified. The flood control features would provide about 90 percent protection of all alluvial bottom land below the dam, plus protection for highly developed residential areas in the southern part of Bartlesville, Okla. It is possible that immediate construction of Sand Creek Reservoir could be based on allocation of a high percentage of the storage to flood control, then in future years, as the demand for water supply increases, the storage for flood control could be reassigned to upstream structures and the storage in Sand Creek utilized for water supply.

Various studies have been made on a main-stem reservoir near Copan, Okla. Such a structure has not been economically justified because of downstream drainage needs. It is possible that, in future years, land values will be such that a restudy of Copan Reservoir and a reevaluation of the economics would demonstrate its feasibility.

WATER SUPPLY

Water supply in the Caney River Valley is dependent entirely upon surface sources. Bartlesville and Dewey, Okla., have depended upon the Caney River as a primary source. By reason of a contract recently executed with the Corps of Engineers, the city of Bartlesville has obtained a firm supply of water totaling 11.2 million gallons per day. This quantity should meet the estimated domestic and industrial requirements until the year 1980. (See attached chart entitled "Estimated Water Demand and Supply for Bartlesville, Okla. and Environs Including Dewey, Okla.") For the period 1980 to 2000, an additional 6.5 million gallons per day will be required. The city of Bartlesville has looked toward Sand Creek as the logical next step in developing a future water supply. To be economical, costs should be in the order of $100 to $200 per acre-foot, including transmission to the city.

IRRIGATION

Irrigation is increasing in importance along the river valleys in Oklahoma. It appears that more and more of the storage in main-stem reservoirs will be required for this purpose. Water released for maintenance of flow during drought is also valuable as irrigation water. Consideration should be given to

storage reallocation for this purpose with the flood control storage thus relinquished assigned to upstream structures. It is also believed that material irrigation benefits will accrue to the proposed Sand Creek Reservoir.

POLLUTION ABATEMENT

In times of low flow and drought, maintenance of flow on the Caney River and its tributaries is desirable to maintain the quality of water for domestic and agricultural use. At Hulah Reservoir, 7,100 acres of storage is now allocated for this purpose. It may well be that an additional storage increment will be required in future years. Adequate storage for this purpose should be provided in Sand Creek Reservoir.

RECREATION

The popularity of existing reservoir areas for recreational purposes indicates an expanding need in this area. The site of the proposed Sand Creek Reservoir will be ideal in this respect since it is adjacent to Osage Hills State Park. As an example of the recreational use of reservoir facilities, Hulah Reservoir was visited by 578,000 people in 1958 and 443,000 people so far in 1959.

SUMMARY

In summary, upstream flood prevention should be emphasized: feasibility studies on the proposed Sand Creek Reservoir should be completed and the project started, initially for flood control, irrigation, and pollution abatement, and later for water supply.

Local organizations are in existence and interest is high in water resources development.

Respectfully submitted.

MILTON PIPER, *President.*

PHILLIPS PETROLEUM CO.,
Bartlesville, Okla., November 25, 1959.

GENTLEMEN: Since Phillips Petroleum Co. maintains its headquarters and executive offices in Bartlesville, Okla., it is vitally interested in the continued development of the community. Its almost 5,000 employees in Bartlesville contribute substantially to the economy of the area. Consequently, we wish to endorse the statement submitted to your committee by the Bartlesville Chamber of Commerce concerning water resources development needs in the Caney River Valley.

Respectfully submitted.

PAUL ENDACOTT, *President.*

CITIES SERVICE OIL CO.,
Bartlesville, Okla., November 25, 1959.

GENTLEMEN: Cities Service Oil Co. (Delaware) wishes to take this opportunity of endorsing the statement submitted to your committee by the Chamber of Commerce of Bartlesville, Okla. Bartlesville is the headquarters for our company and, of course, we are interested in programs which are for the betterment of the community.

Respectfully submitted.

HARRIS BATEMAN,
Manager of Engineering.

CITY OF BARTLESVILLE, OKLA.,
November 24, 1959.

GENTLEMEN: The city of Bartlesville, Okla., wishes to submit this endorsement of the statement submitted by the Bartlesville Chamber of Commerce in connection with water resources development in the Caney River Valley, Okla. Efforts should be made to carry out the proposed program as rapidly as economically justified.

Sincerely yours,

W. A. HENSLEY, *Mayor.*

OFFICE OF THE BOARD OF COUNTY COMMISSIONERS,
WASHINGTON COUNTY,
Bartlesville, Okla., November 25, 1959.

GENTLEMEN: The county commissioners of Washington County, Okla., herewith endorse the statement submitted by the Bartlesville Chamber of Commerce outlining the needs for water resources development in the Caney River Valley of Washington County, Okla.

The proposed development work is needed and your committee is requested to exert its influence in authorizing the work.

Respectfully submitted.

IRA H. CLINGAN, *Chairman.*

BUSINESSMEN'S ASSOCIATION,
Bartlesville, Okla., November 24, 1959.

GENTLEMEN: The Businessmen's Association of Bartlesville, Okla., endorses the statement prepared and submitted by the Bartlesville Chamber of Commerce outlining the needs for water resources development in the Caney River Valley of Washington County, Okla.

The proposed improvements and development work is seriously needed and your committee is requested to exert its influence authorizing the work.

Yours truly,

W. C. YOUNG, *President.*

OKLAHOMA SOCIETY OF PROFESSIONAL ENGINEERS,
Oklahoma City, Okla., November 25, 1959.

U.S. SENATE SELECT COMMITTEE ON NATIONAL WATER RESOURCES.

GENTLEMEN: The Bartlesville Chapter of the Oklahoma Society of Professional Engineers endorses the statement submitted to your committee by the Bartlesville Chamber of Commerce concerning water resources development needs in the Caney River Valley.

We encourage your committee to carry out the proposed program as rapidly as possible.

Respectfully submitted.

V. L. COSTELLO, *President.*

ENGINEERS CLUB OF BARTLESVILLE,
Bartlesville, Okla., November 25, 1959.

GENTLEMEN. The Engineers Club of Bartlesville wishes to submit this endorsement of the statement of the Bartlesville Chamber of Commerce to the U.S. Senate Select Committee on National Water Resources hearing at Oklahoma City, November 30, 1959. This statement and the club's endorsement are consistent with similar statements made several years earlier to the Arkansas-White-Red Basin Interagency Committee.

Effort should be made to carry out the proposed program as rapidly as possible.

Respectfully submitted.

R. J. BENNETT, *President.*

Colonel WILSON. Thank you.

Mr. G. L. Willis, the mayor of Shidler, Okla., is here and has prepared a statement which I ask permission to file with the committee.

The CHAIRMAN. Very good.

(The information referred to follows:)

SHIDLER, OKLA., *November 30, 1959.*

Re report and testimony on Shidler Reservoir on Salt Creek.

The U.S. SENATE SELECT COMMITTEE ON NATIONAL WATER RESOURCES,
Oklahoma City, Okla.

GENTLEMEN: The obvious need for a strengthened national water resource program has been demonstrated time after time in the great Southwest region.

Some of these lessons have been most bitter ones, as witnessed in the most recent floods experienced in and around the city of Tulsa, Okla.

We represent the people of Shidler, Okla., a small industrial and ranching community of approximately 2,500 people located in north-central Oklahoma. Our needs for an adequate water supply has been most desperate over the years past and once again we find ourselves in a most critical position. Now we feel we must look to the Federal Government for aid in building an adequate water supply for the next 40 years, during which period we know we will see a population increase to the extent that as a city or State we could not float bond issues large enough to build such a vast project, although we know that a project of this type will more than pay for itself in additional taxes received, additional income and other remunerations. Our community has been handicapped in the past years for water, to bring us up to national average use, because the present cost of water has been prohibitive.

Past history has proven that every attempt that has been made to build an adequate municipal and industrial water supply has been too tremendous an undertaking. We must look to the Federal Government for water relief, not only to grow, but in essence to survive. Again, this is not an expenditure to be looked upon in the nature of a subsidy, but rather, as it has been demonstrated in area after area, a most fruitful investment, whose yield has been tenfold.

Our population continues to grow. Our industries continue to flourish. Our water demands multiply by leaps and bounds. Our future water supply remains stagnant. This has become a critical national problem which our Federal Government must solve now, through proper planning of God-given resources in those areas which are fortunate enough to be graced with this abundance.

Most respectfully submitted.

MAYOR'S COMMITTEE FOR SALT CREEK DAM ASSOCIATION,
G. L. WILLIS, *Mayor.*

Colonel WILSON. Mr. Lawrence Cannon, the president of Kaw Dam and Reservoir Development Association, Ponca City, Okla., is here, and he has two gentlemen with him, I think, who will make very brief statements. They will file their statements and make a very brief summary.

Mr. Cannon.

STATEMENT OF L. S. CANNON, PRESIDENT, KAW DAM AND RESERVOIR DEVELOPMENT ASSOCIATION, PONCA CITY, OKLA.

Mr. CANNON. Senator Kerr and distinguished members of the committee, to save time we will have two brief oral statements which will be filed along with a more elaborate report, but may I say we do want to thank you for letting us appear before this committee and explain to you some of our water problems. We represent north-central Oklahoma and south-central Kansas.

The first man who will make the statement is a man who has lived a lifetime on the Arkansas River Basin. He is recognized as an authority on water and for many, many years he has been a consulting civil engineer. So for those of you who do know him—and I am sure a lot of you do—I would like to introduce at this time Mr. Fred Fellows, consulting engineer of Ponca City.

The CHAIRMAN. Come around here, we want to hear you.

STATEMENT OF FRED G. FELLOWS, CONSULTING ENGINEER, PONCA CITY, OKLA.; CHAIRMAN, WATER RESOURCES COMMITTEE, PONCA CITY CHAMBER OF COMMERCE, REPRESENTING KAW DAM AND RESERVOIR DEVELOPMENT ASSOCIATION

Mr. FELLOWS. Senator Bob, Senator Monroney, and other distinguished members of your committee, I am Fred G. Fellows, consulting civil and industrial engineer of Ponca City, Okla.

I am chairman of the Water Resources Committee of the Ponca City Chamber of Commerce and also representing here the Kaw Dam and Reservoir Development Association and the peoples of south-central Kansas and north-central Oklahoma in the water problem of those areas.

It is a pleasure to be here and to present to you what we believe to be the only ultimate solution to providing future water needs for the cities and towns in the central Arkansas River Basin within a radius of 75 to 100 miles of Ponca City, Okla.

We believe this solution to be the construction of the Kaw Dam and Reservoir which tentatively has a flood-control storage of 1,422,481 acre-feet and a use storage of 433,983 acre-feet.

The Kaw Dam and Reservoir is located on the Arkansas River at mile 652 and 9 miles east of Ponca City, Okla., on Highway 60. It has a contributing drainage area of 47,000 square miles. The dam will be some 124 feet high and approximately 15,000 feet long.

The water from this reservoir, in addition to supplying water for possible power and irrigation uses, can supply water for the municipal and industrial needs of Blackwell, Chilocco Indian School, Enid, Fairfax, Newkirk, Ponca City, Shidler, Tonkawa, Okla.; also Arkansas City and Winfield and possibly other south-central Kansas cities.

The Central Oklahoma Basin is a region of climatic extremes located between the arid west and the humid east. Annual precipitation varies from 54 to 18 inches on the east edge of the basin and from 34 to 10 inches on the west edge of the basin between extreme years of high precipitation and drought conditions.

Drought periods of long duration occur followed by periods of increasing rainfall. These wet and dry periods occur in rather regular cycles of approximately 10-year lengths. Typical drought periods were 1910 to 1917; 1930 to 1936, and the recent drought 1952 to 1956.

The climatic timetable shows that the next serious prolonged dought period will be in the years from 1972 to 1976 and this may well be the most severe drought period that has ever been experienced.

The CHAIRMAN. Pardon me. What period did you refer to?

Mr. FELLOWS. What?

The CHAIRMAN. You referred to a period of drought.

Mr. FELLOWS. Yes.

The CHAIRMAN. Did you identify the period?

Mr. FELLOWS. 1972 to 1976 is when the next severe drought period will come along.

The CHAIRMAN. Yes. All right.

Mr. FELLOWS. A study of some 25 years' duration of the hydrologic and climatic conditions in the basin and the water use history of its towns and cities which has already included serious water shortages convinces me that catastrophic water shortages will occur in the early 1970's unless a visible surface water supply is provided.

The only underground water supplies available and usable are contained in the small water-bearing sands adjacent to the rivers.

Wells in such formations are already overtaxed or have been so heavily drawn on that no dependable increase in withdrawal is advisable.

I can foresee that if such surface water supply is not supplied within the next 10 years by such a reservoir as will be created by Kaw Dam we will experience a water shortage of real magnitude which will possibly close down industries, powerplants, indirectly curtail farming operations and result in blight on entire communities.

Water shortages were experienced in the basin in 1954 through 1956. That is both in Kansas and in Oklahoma, which will look small indeed to what can happen in the 1970's when water use per capita and population will be materially greater.

I have read the report—this is not in my statement here—but the statement here that was made by Prof. George Reid. I have read that statement and gone over it in detail, and they have done an admirable piece of work in the writing of that.

However, I wish to call attention to one thing.

The per capita figures which they came up with are average figures. We all know that not only in this State but in other States, towns, due to their per capita wealth and to the way in which that town is built up, one would use considerably more water than another one. Another thing is that averages which are made up from a number of cities possibly outside of the State of Oklahoma and different climatic conditions, the water use in them may not compare with what we would expect here in this State.

As a matter of fact, and I will read you here in regard to Ponca City. The domestic per capita consumption in Ponca City as an example where accurate records of water use have been kept for over 25 years, has varied from 109 gallons daily in a wet year such as 1950–51 to 223 gallons daily in a drought year such as 1954–55 and 1955–56.

The average domestic consumption over a 9-year period was 158 gallons per capita daily. Gentlemen, that has happened in the last 9 years. That it is going to be more than that in 1970 I think you will all agree.

Most of the towns in this area can settle for little less than 225 gallons per capita daily in the 1970 drought period—that is the next drought period that will come along—plus whatever industrial water is also required at that time.

I wish to also state the per capita figures that I have stated are for domestic water only. Our actual water consumption in Ponca City during the drought years 1955–56 amounted to 426 gallons per capita if you include industry.

Engineering studies to determine future requirements of Oklahoma cities and towns should be based on factual studies of water consumption by Oklahoma municipalities and not hypothetical conclusions derived from studies of other areas in the United States not having comparable climatic and water supply conditions to this area.

And that investigation is underway at the present time.

I thank you.

The CHAIRMAN. Thank you.

I would like to have you supply to me and to the record the source of your information on which you based your forecast.

I want to say to you that I thoroughly am in complete accord with it. It is a thesis which I have been working on.

I will appreciate it if you would provide me the source of information on which you make that.

Mr. FELLOWS. I will be glad to furnish you additional copies. Don McBride already has them.

The CHAIRMAN. I understand. I am not talking about the statement that you made. I am talking about the source of information on which you base the forecast of the dry period in the seventies.

Mr. FELLOWS. O. K.

The CHAIRMAN. Yes.

Mr. FELLOWS. And send those direct to——

The CHAIRMAN. To me.

Mr. FELLOWS. To you in Washington?

The CHAIRMAN. To me in Washington.

Colonel WILSON. Thank you very much.

In the interest of saving time, Dr. Ball, representing the Blackwell Chamber of Commerce, wishes to file his oral statement of which I have copies here for the committee.

(The statement referred to follows:)

STATEMENT OF BLACKWELL CHAMBER OF COMMERCE

Gentlemen, the 11,000 citizens of Blackwell, Okla., through its chamber of commerce, are asking that the Bureau of Reclamation expedite in the quickest manner the funds that are available for more detailed investigation of the Chikaskia River project in northern Oklahoma and southern Kansas.

The completion by the Bureau of its report will greatly aid the representatives of the various communities which are affected to seek congressional authorization of this project. A project which this chamber of commerce feels is greatly needed.

Here are a few facts which the chamber feels will be of benefit to this committee in its deliberations:

Present and projected population of Blackwell, Okla.

1950	9,199	1970	15,000
1959	11,689	1980	20,000
1960	11,689		

Present and projected water requirements of Blackwell, Okla.

	Million gallons daily		*Million gallons daily*
1959	5.5	1970	7.5
1960	5.5	1980	10.0

PRESENT WATER SUPPLY

Blackwell obtains its water supply from dams located upon the Chikaskia River, which dams were built by the city of Blackwell.

The present water supply from such dams do not presently meet the requirements during a drought year, such as 1954 when restrictions were placed upon users, nor will it ever begin to meet the future requirements of the area.

Therefore, gentlemen we heartily endorse a speedup program by the Bureau of Reclamation for its report and for congressional authority on the Corbin Reservoir.

Thank you for your time.

Colonel WILSON. The next witness will be Mr. George Fox, who is president of the Neosho-Cottonwood Flood Control Association.

Mr. Fox comes from Chetopa, Kans., where he is the president of the Chetopa State Bank and he has been active in the field of water resource development for many years.

Mr. Fox.

STATEMENT OF GEORGE FOX, PRESIDENT, NEOSHO-COTTONWOOD FLOOD CONTROL ASSOCIATION

Mr. Fox. Thank you, Colonel Wilson.

Senator Kerr and members of the committee, in the interest of time I will not read the statement. We are filing copies. But I would like to dwell for a moment on a paragraph or two in this statement in which we would like to bring out the request for a further study on the lower reaches of the Neosho River, and its tributaries.

As mentioned in the statement it is doubtful that we can get a cost-benefit ratio for further main stem dams on the Neosho River itself.

However, between the Burlington Dam, which is now under construction on the Neosho, and the Oklahoma State line, there are a number of large tributary streams.

To name a few of them, Labette Creek, which is at times almost as big as the Neosho River itself, and a number of other streams up as far as Chanute, Kans. These various tributary streams cover almost one-third of the entire area of southeastern Kansas. They act as a gathering pipeline, so to speak, of all the streams running into the Neosho and then it provides to dump all its water down on top of Oklahoma—Miami, Okla., especially.

It is very imperative that we attempt to get a further study of the feasibility either through the Army Engineers or the Bureau of Reclamation to determine the feasibility of smaller dams on the tributary streams to the Neosho River in order to prevent this flooding that will continue even after the completion of John Reed Dam at Burlington on the Neosho.

I think that there are a number of these small streams that probably will come into a cost-benefit ratio program that would let us develop some major reclamation projects or, possibly, an Army engineer's project on some of the major feeder streams to the Neosho River.

I think that covers the major part of what we need to complete a full coverage of Neosho after to the program that is already started there will have reached its completion.

The CHAIRMAN. Thank you very much, Mr. Fox.

(The statement follows:)

STATEMENT OF GEORGE A. FOX, PRESIDENT, NEOSHO-COTTONWOOD FLOOD CONTROL ASSOCIATION

Mr. Chairman and gentlemen of the Senate select committee, I am Gorge A. Fox, of Chetopa, Kans., president of the Neosho-Cottonwood Flood Control Association, which encompasses the entire Neosho River from Miami, Okla., to Council Grove, Kans., and the Cottonwood River from Emporia, Kans., to Marion, Kans.

The last session of Congress was very kind to our watershed, giving us one new start of construction and one new start of planning. We have four projects authorized in the Army Engineers program. Two of them—Council Grove and Burlington—are now under construction. One, at Marion, is now in the planning stage, and the smallest one at Cedar Point has nothing to date.

When these projects are all completed, the entire north half of our watershed on the Neosho River will then be in good condition to withstand flooding and endure drought. However, the south half of the Neosho River watershed from Burlington, Kans., to and including Miami, Okla., will still be in a position of too much water at times and too little water at other times.

The facts bearing out the above statement are as follows: As of today there are dozens and dozens of farmers contemplating the use of the Neosho River as a source for irrigation upon completion of the Burlington Dam. Frankly, I do not believe there will be enough water in the lake to furnish half of them with the water they will need. This is allowing nothing for municipal and industrial water supplies in the various towns and cities along the river. In addition to these, we know that the projected increase in population and water consumption will be many times greater in the next few years than it is today.

Now, on the other hand, when the Burlington Dam is completed, the lower Neosho will have no protection from the heavy rainfall which comes to southeast Kansas and northeast Oklahoma periodically.

It is the belief of the association that it is imperative for this committee to ask for a further study, either by the Army Engineers, the Bureau of Reclamation, or the Soil Conservation Department to ascertain the feasibility of placing the smaller dams on the tributaries of the Neosho River from Burlington, Kans., to Miami, Okla. We realize that it might not be feasible to place another dam across the main stem of the Neosho, but we believe that it is very likely that the cost-benefit ratio can be justified for small dams on tributary streams to the Neosho in this area. This area for study will cover all or the greater part of six counties in Kansas and two counties in Oklahoma. In Kansas, Woodson, Allen, Neosho, Crawford, Labette, and Cherokee Counties. In Oklahoma, Craig and Ottawa Counties.

The 1951 flood, caused by the Neosho River and its tributaries, resulted in more than $50 million in damages to the above-mentioned counties of Kansas and Oklahoma.

Colonel WILSON. Mr. J. C. Wilkerson, president of the Grand Valley Industrial Development Association, was to be here today but he was unable to be present and in his stead we have Mr. J. B. (Buss) Martin, of the Miami Chamber of Commerce, who will file a statement with this committee concerning the Grand Valley development and will make a brief oral statement.

The CHAIRMAN. Come around, Buss.

STATEMENT OF J. B. (BUSS) MARTIN, MIAMI, OKLA., CHAMBER OF COMMERCE, REPRESENTING J. C. WILKERSON, PRESIDENT, GRAND VALLEY INDUSTRIAL DEVELOPMENT ASSOCIATION

Mr. MARTIN. Senator Kerr and members of the Senate select committee, to make this brief, I will read Mr. Wilkerson's statement:

I am J. C. Wilkerson of Pryor, Okla., president of the Grand Valley Industrial Development Association, an Oklahoma corporation with more than 200 members representing manufacturing, transportation, recreation, and general business of northeast Oklahoma. Ten counties are represented in our membership with a board of directors, consisting of 20 members, 2 from each of the following counties: Osage, Rogers, Tulsa, Muskogee, Delaware, Washington, Nowata, Craig, Ottawa, and Mayes.

Our only purpose for existence is the further development of the economic growth of our area, by creating more jobs for our people.

The greatest industrial asset that we in the northwest Oklahoma have is our water. For the past 4 years, the members of our organization as individuals, cities, and industries have endorsed and worked for the construction of Markham Ferry Dam.

The Grand River Dam Authority was advised by the financial world that Markham Ferry Dam could not be built without a long-term contract with a large power company. Nine such power companies were contacted by Grand River Dam Authority and only one, the Public Service Co. of Oklahoma, submitted a proposal for the construction of Markham Ferry Dam. A power ex-

change contract was negotiated with the Public Service Co. in December of 1956. In 1957 the Legislature of Oklahoma authorized the Grand River Dam Authority to enter into such a contract. The Supreme Court unanimously approved the contract. This progress was encouraging to the business, professional, and industrial leaders of northeast Oklahoma. The Congress of the United States in 1955 appropriated $6,500,000 as a Federal contribution for flood control to be built into Markham Ferry Dam.

Hearings on the project have been before the Federal Power Commission for the past 2 years, the final brief to be filed December 1, 1959. The Federal Power Commission staff has recommended approval of the power exchange contract.

A minority group in Oklahoma that represents approximately 16 percent of the output of Grand River Dam Authority, abetted and assisted by selfish groups in other States, has fought and blocked the construction of Markham Ferry Dam, which is of great importance to the economic growth of northeast Oklahoma, notwithstanding the importance and need of Markham Ferry Dam to the Arkansas Basin development.

Your endorsement, encouragement, and support for the immediate construction of Markham Ferry Dam is respectfully requested by the Grand Valley Industrial Development Association.

Thank you.

The CHAIRMAN. Thank you, Buss.

(The prepared statement referred to follows:)

STATEMENT FILED BY J. B. (BUSS) MARTIN, MIAMI CHAMBER OF COMMERCE

Negotiations between the representatives of the authority and the company, looking toward the formulation of a contract for the effective coordination of the systems of the parties began early in 1955, and continued until August 5, 1957, when the present contract was signed by the parties. During these extended negotiations, nine different drafts of the contract were prepared, intensively studied, and carefully considered by the parties. Numerous public meetings throughout northeastern Oklahoma were held at which all members of the public, all civic organizations of cities and towns in the area, the customers of the authority, officials of the State, and all others interested in the matter were given opportunity to express their ideas and suggestions and were given all information requested whereby they might inform themselves as to the details of the plan and the specific provisions of the contract.

By March 6, 1956, a draft of the contract had been worked out to the extent that the parties believed they were in substantial agreement on its terms, pertaining to coordinated operation. This particular draft is referred to as the draft of March 6, 1956.

During the negotiations prior to the draft of March 6, 1956, the authority had been guided by the counsel of its consulting engineers, W. R. Holway & Associates. W. R. Holway designed and supervised the construction of the Pensacola Dam and for 25 years thereafter had acted as consultant for the authority, supervising the construction of its entire transmission system, the design and installation of all improvements and additions to its generating equipment, and had handled all engineering problems related to operation of the entire system and the formulation of the authority's policies on power sales.

On the basis of these long years of study of the needs of the authority, and of the area in which the authority operated, Mr. Holway had worked out the expansion plan for the authority embodied in the proposed contract. Since the plan involved expenditure of large sums of money, and included pump-back units which, although long used in other areas were little known in this area, Mr. Holway recommended to the Board that all features of the contract and the proposed expansion plan be submitted for study to a competent firm of independent engineers. Accordingly, the authority submitted the contract to its fiscal agent, Stranahan, Harris & Co., of Toledo, Ohio, which in turn submitted it to its legal counsel, Wood, King & Dawson, and thereafter the authority authorized its fiscal agent to employ a firm of independent engineers to make detailed studies of the contract and of the expansion plan embraced therein, and of the feasibility of financing that plan. After due consideration, the firm of R. W. Beck & Associates, of Columbus, Nebr., was employed for this purpose. The Beck organization has a nationwide reputation as experienced, reliable

utility engineers, specializing in hydroelectric and municipal installations. Not only was the Beck organization employed to study the plan and the contract, it was also specifically employed to assist the authority and the Holway organization in further negotiations with the company designed to meet various objections raised by the authority with respect to the March 6, 1956, draft of the contract, and from that time on the Beck organization participated actively in all subsequent negotiations. After weeks of intensive study, the Beck organization issued its first engineering report on May 10, 1956. Since the Beck concern was to participate in further negotiations in behalf of the authority, it seems reasonable to assume that this report stated every possible objection to any provision of the contract, and of the expansion plan, which could possibly be considered unfavorable from the standpoint of the authority.

The report embraced an exhaustive study of the plan set out in the contract and then set up two alternate plans for independent and separate operation and expansion of the authority's system under which alternate plans no contract would exist between the authority and the company.

Outline of these three plans, with a detailed explanation of all objections raised by the Beck report, to the provisions of the contract, and of all changes made in the contract to meet such objections is set out in exhibit A hereto attached. The Beck organization participated continuously and actively, both as engineers and as negotiators, in this revision of the contract and were well satisfied with the results achieved, but they also made further studies and reports which demonstrated these favorable results.

Under date of October 5, 1956, the Beck organization transmitted to the authority, through Stranahan, Harris & Co., its fiscal agents, a supplmental report made at the request of the authority, the purpose of which was to determine the best and most economical expansion plan to meet the long-range needs and plans of the authority. Plan I included the overall plan embraced in the contract between the authority and Public Service Co. with 100,000 kilowatts in hydrogeneration installed at Markham Ferry and an eventual 240,000 kilowatts of generation in pump-back installations. Plan II assigned for such study contemplated installation of only 48,000 kilowatts in hydrogeneration at Markham Ferry, accompanied by additional steam generation as same was required for the authority to operate on an independent basis. Plan III contemplated an entirely new steam generating plant in the Chouteau area in which one 30,000-kilowatt unit would be maintained permanently as reserve system capacity and 30,000-kilowatt units would be installed from time to time as the authority's system load grew and the authority would operate as a separate and independent system. Each of the three plans was studied on the basis of the same load growth.

The report states that it was apparent from the outset that plan II would be appreciably less profitable than either plan I or plan III so the principal studies were a comparison of the advantages of plans I and III. The conclusions stated by this report show:

1. Cumulative net surcharges on sales to the authority's customers (which might be necessary in times of low water in the GRDA reservoirs) are less for plan I than for plan III.

2. Surplus cash available for corporate purposes and cash in reserve funds averaged approximately $570,000 more per year under plan I than under plan III.

3. Retirement of existing debt under plan I could be effected by the year 1977 as compared to retirement thereof by 1981 under plan III.

The report also noted the following favorable factors which were difficult of evaluation, to wit, that the hydro facilities contemplated by plan I would have a useful life well in excess of 50 years as compared to a useful life of steam facilities contemplated by plan III which would normally be from 30 to 35 years; further, that under the provisions of plan I, the authority's existing hydroplant would be given a capability of 90,000 kilowatts whereas under plan III, on the basis of separate and independent operation by the authority, the Pensacola generation could be given a rating of only 67,000 kilowatts; further, under plan I the reservoir elevation was maintained at 730 feet, as compared to a drawdown to elevation of 713 which would occur during low water flow if the authority operated under plan III; and further, that the Markham Ferry project, constructed as contemplated by plan I, would provide additional flood control for eastern Oklahoma as well as additional recreation opportunities for the public, as contracted with these advantages available to a less degree under plan III. Under this study the plan proposed by the GRDA-Public Service Co.

contract was found substantially more favorable to the authority and its customers to a minimum extent of $570,000 per year.

As a further test for the determination of the advantage to the authority of the proposed coordinating agreement, with the company, the authority, through its fiscal agent, requested of the Beck concern a further study designed to determine the estimated financial results or benefits to the authority that could have been attained by the authority had it and the company been operating under the terms of the proposed coordinating agreement during the period from January 1, 1949, to October 1, 1956, rather than under the terms of the contracts between these parties which had been in effect during this period. Pursuant to this request, R. W. Beck & Associates submitted their detailed report under date of December 14, 1956. The report states the conclusions reached as follows:

1. "As relates to the authority's customers, other than the company, the pro forma operating results show that if the proposed power contract had been in effect during the period, January 1, 1949, to October 1, 1956, the cumulative surcharges paid by the authority's customers would have been approximately $1,430,000 less than were actually paid during such period."

2. "As relates to the holders of the authority's bonds, the pro forma operating results showed that the cumulative difference in the balance available for debt service without application of any surcharges, was approximately $2,526,000 in favor of operations by the authority under the proposed power contract during such period."

The supplemental study shown by the Beck report dated October 5, 1956, disclosed conclusively that it was to the advantage of the authority to operate in coordination with Public Service Co. as contemplated by the proposed contract, and the final report, dated December 14, 1956, applied the acid test to the matter in that it disclosed that if the authority and the company had been operating under the terms of the proposed contract during a 7¾-year period stated, the customers of authority would have benefited to the extent of $1,430,000 in surcharges which would have not have been paid by them to the authority; and that the authority, without application of any surcharges, would have been in a cash position bettered by approximately $2,526,000.

Having completed the supplemental studies described, the Beck organization, under date of December 27, 1956, wrote the fiscal agent as follows:

"At your request, we have been for the past several months assisting the staff and directors of the Grand River Dam Authority in the negotiation of a power contract between the authority and the Public Service Co. of Oklahoma, the rates, terms, and conditions of which were summarized in our report of December 14, 1956.

"In addition, three plans were studied, the results of which were included in our report of October 5, 1956. The pro forma operating results of this study of the plans indicate that plan I, hydro-generation integrated with Public Service Co., produced the greatest return to the authority under both the hypothetical, historical and the estimated future conditions. In addition, the surcharge to the authority's customers were the least under plan I.

"We, therefore, are of the opinion that this contract is beneficial to both the authority and its customers, and the authority by operating under the terms and conditions of the proposed contract, would therefore be acting in the interest of the public."

On the basis of the supplemental Beck studies made after the contract had been changed by negotiation to meet the objections and suggestions stated in their May 10, 1956, report, and on the basis of other investigation made by its agencies, and of the continuing conference had in further negotiations of the proposed contract, the authority's financial advisor, under date of December 13, 1956, wrote the authority's then general manager expressing its full approval of the terms of the contract. This letter is set out in full in exhibit A.

Thereafter, although the authority with the advice and counsel of its engineers and negotiators and its fiscal agent, had determined that its proposed contract with company had been put in the best possible shape, it determined that it should investigate the possibility of securing a more favorable proposal embracing largely the same terms as the proposed contract with company, from other utility systems operating in the area. This determination was expressed in resolution adopted by the authority's board of directors on July 1, 1957, and on July 3, 1957, a special negotiating committee appointed by the board sent invitations for proposals to Oklahoma Gas & Electric Co., Public Service Co. of Oklahoma, Empire District Electric Co., Kansas Gas & Electric Co., Southwestern Gas & Electric Co., Arkansas Power & Light Co., Southwestern Power Ad-

ministration, KAMO Electric Cooperative, Inc., and Western Farmers Electric Cooperative, with request that proposals be submitted on four separate plans, plan I was the plan set out in the contract with company. Plan II was to construct the Markham Ferry Dam with 48,000 kilowatts in hydro generation initially installed and adding of steam generation in the authority's system to integrate operations of the authority's system with operations of the bidders' system, bidder to purchase authority's surplus hydro capacity as peaking capacity from Markham Ferry and Pensacola hydroplants and to sell to the authority such supplementary electric requirements as were needed to carry its loads.

Plan III was that authority lease and operate a 60,000-kilowatt steam generating plant to be constructed by KAMO and leased to the authority, and construct the Markham Ferry plant with an initial hydro capacity of 48,000 kilowatts and adding thereto from time to time generation, operation of authority's system to be integrated with that of bidder, bidder to purchase authority's surplus hydro peaking capacity and to sell the authority its supplementary requirements needed to carry its load. Plan IV was any other proposal or combination of plans I, II, and III which would permit the financing and construction of the Markham Ferry Dam and the hydroelectric plant and would also provide authority with electric power and energy to meet its requirements. Any proposal, to be acceptable, should be so based as to permit financing and construction of the Markham Ferry Dam and hydroelectric plant and any other improvements contemplated by any plan submitted. Interested bidders were requested to file some proposal by July 12, 1957, but the invitation for bids specifically recited that the authority recognized any interested concern would be unable to submit detailed plans within the limited time and asked any concern interested in making a proposal to advise the authority in writing whereupon additional time would be given within which a detailed proposal might be made. No formal proposals other than that made by Public Service Co. and embraced within the contract were received in response to this invitation.

Since the execution of any expansion plan on the part of the authority required it to go to the Oklahoma Legislature to secure the right to issue additional bonds to finance the expansion, the whole program embodied in the contract, with all counter-proposals, objections, suggestions and every facet of each was presented to the 26th legislature which went into session in January 1957.

Bills were introduced in both Houses of the legislature embracing in their scope the major elements of all the projects involved in the overall expansion plan. Even before the legislature convened, a special committee appointed by the legislative council had commenced a study of the overall plan, and of the proposed contract, and had sought the advice of independent engineers as to the merits of both. H. W. Blalock, of Washington, was one such engineer. During the regular session of the legislature, a special committee of the senate employed the late W. H. Stueve, to study certain projects included in the overall plan. Both these gentlemen appeared at numerous public meetings to state and explain their views in the matter, and both testified on various occasions at hearings held by legislative committees. Since Mr. Blalock was employed by an interim committee of the legislative council, he considered principally the objections raised by the first Beck report, together with impressions gained from his personal study of the overall plan. Thus, Mr. Blalock did not follow through on the changes made in the contract after issuance of the first Beck report. Mr. Stueve stated certain objections to the plan, but his study gave principal consideration to the feasibility of installing so-called pump-back units at certain locations, which have been the subject of intensive engineering study, at an indefinite time in the future. Mr. Stueve concluded that installation of various of the pump-back units contemplated in the long-range plan would prove uneconomical and would result in loss to the authority. His report indicates that he based his conclusion largely upon comparisons made with pump-back units installed by TVA in Tennessee and by the Brazos River Authority in Texas, but included a time when those similar projects were experiencing drought in the streams upon which they are located. He further ignored the fact that the installation of such pump-back units, in the plan of the authority, must necessarily be determined upon at such time in the future as engineering studies determine such installations would be profitable to the authority.

It is idle and misleading to the public at this time to debate the merits of Mr. Stueve's report, particularly, since his principal conclusion, namely that the authority should secure the services of experienced, capable engineers and subject all aspects of its plan to careful study, has been faithfully followed. Mr.

W. R. Holway, who designed and supervised the construction of the Pensacola Dam on Grand River and has acted as engineer and consultant for the authority over a period of 25 years, with his associates, has made an exhaustive study of every portion of the long-range expansion plan and has made particular study of the so-called pumpback units. He has checked with all recognized experts in that field and his studies and investigations have been aided and checked by the Beck organization. Mr. Blalock, Mr. Stueve, Mr. Holway, and Mr. Beck have testified on various occasions before committees of our legislature during the period the project was under study by the legislature.

Thus, it is apparent that when the enabling legislation introduced in both houses reached the stage of final consideration and passage, the legislature, all interested officials, all members of the public who had interested themselves in the matter, and followed the information published throughout the State in the newspapers, were, or could have been, possessed of all pertinant information concerning the contract, the plans for expansion of the authority, and the results expected to be achieved on the basis of sound and exhaustive engineering studies made by two sets of engineers, the fiscal agent, and the attorneys for the authority.

Furthermore, during this period, the public was reminded that the proposed plan consisted of two major portions, the first was the plan for the future expansion of the authority's system to provide itself with adequate power for the supply of its existing customers and for the expanding use of these customers, and for the supply of adequate power to new industries who are sought by the united efforts of the public in the area to come into Oklahoma and assist in its development. The second part of the plan was an operating problem which was not new in any sense of the word to the authority, to the company, and to the interested members of the public. The plan of operation proposed by the contract was simply a return to the plan of coordinated operation that was established during World War II after the authority's properties were expropriated by Executive order of President Roosevelt and turned over to Federal Works Administration for its direct control and operation. During the full period of the defense effort, and of World War II (November 1941, to September 1, 1946), said project was operated fully coordinated with the systems of all other electric companies in the area, to the end, that by full coordination of all generating and transmission systems, maximum amounts of power could be made available for defense use and for war production. This meant that the hydro capacity of the authority was used for maximum peaking values during the entire period, to the material benefit of the defense effort, of war production, and of the authority itself. So the proposed contract, insofar as its operating features are concerned, is merely a return to a plan previously demonstrated to be practical, economical, and efficient.

Being thus fully advised, the legislature put senate bill No. 268 into final form and the bill passed the senate on May 15, 1957, with a vote of 40 ayes and 2 nays, and on May 16, 1957, passed the house, without change, by vote of 101 ayes to 10 nays. A record of the vote in both houses is shown in exhibit A.[1]

Thus passed, the bill went to the Governor on May 20, and was approved by him on May 22, 1957. Section 4 of this act authorized the authority, in its discretion, to file an application with the Supreme Court of Oklahoma for the approval by said court of any bonds to be issued under the act, or to file a petition for a judgment determining the validity of any proposed contract or action arising from the exercise of any of the powers, rights, privileges, and functions conferred upon the district under the act. Exclusive original jurisdiction was conferred upon the supreme court to hear and determine such an application. This section further provided that any such decision of the court should be a judicial determination of the validity of additional bonds to be issued which should be conclusive as to the district, its officers, and agents and would render the bonds incontestable in any court of the State of Oklahoma and further provided that any judgment testing any contract or action of the district in an action filed pursuant to the provisions of said bill should have the force and effect of a final judgment or decree. Thus, the contract itself, with all its essential terms exhaustively debated, discussed, and agreed to, and the expansion plan of the authority, was fully passed upon and authorized by the legislature.

Thereafter, on August 5, 1957, the board of directors of the authority and the company, executed the contract in the form in which it had been considered

[1] Exhibits retained in committee files.

by the legislature, with two minor exceptions. At the time of signing, the parties agreed to insert in the contract section 7.4 which is a provision applying for service to the Eastern State Hospital near Vinita, and whereby the company agreed that if it became desirable for the authority to serve that institution in the future, company would thereafter deliver power and energy through its existing facilities for the account of authority. This arrangement is actually similar to that which had been practiced by the parties for a number of years with respect to service to the city of Pryor. The only other change made by amendment reduced to writing and signed by the parties on April 21, 1958. Parties signed August 5, 1957, the last sentence of the third grammatical paragraph of section 2.1 of the agreement read as follows:

"If such financing is not completed by January 1, 1959, this contract shall terminate upon that date just as if never executed."

By the time the amendment was signed, it was already obvious to the parties that the financing arrangements for construction of the Markham Ferry Dam and hydroplant could not reasonably be expected to be completed by January 1, 1959, so in the amendment the language of this sentence was changed to read as follows:

"If such financing is not completed within 1 year after the termination of all litigation delaying the taking effect of said contract, this contract shall terminate just as if never executed."

Likewise, similar revision was made in the wording of the last grammatical paragraph of this same section which dealt with the date on which company was obligated to begin taking or paying for surplus power and energy under the provisions of the contract after the completion of hydroelectric generating facilities at Markham Ferry Dam. This provision also was altered to provide for the expected additional delay in completion of this construction.

Thereupon, in accord with the direction of the legislature, the authority filed cause No. 37928 in the Supreme Court of Oklahoma seeking a declaratory judgment in that court to determine the validity of the contract of August 5, 1957. The decision of the court was rendered December 17, 1957, and the final application for rehearing in said cause was denied January 28, 1958, after which the opinion was reported in 320 Pacific Reporter, 2d series, at page 706. The court declared the contract to be valid, but in its opinion it used the following language to indicate that abundant opportunity had been given any and all interested parties to appear and state their respective opinions regarding the contract. Along this line the court said:

"Thousands of parties have appeared herein as respondents or by attorneys as amici curiae. There are numerous electric cooperatives; the Oklahoma Farm Bureau represents many farm families; numerous signers of a petition of protest are represented; represented also are large number of business and professional persons from the area; other farmers and businessmen appear as Eastern Oklahoma Flood Control Association. Many briefs have been filed and extensive oral arguments have been heard."

"In the instant case, the legislature has outlined the policy of the State and has delegated the authority to contract to the applicant herein. After many months of investigation while aided by engineering and financial experts, and after years of experience in the electrical production field, said Grand River Dam Authority has exercised the power delegated to it by executing the contract here presented. The responsibility therefor rests with the legislative branch of the government."

"The wisdom or advisability of making such a contract has had no part in our consideration of its legality. Our lack of business experience and capacity in the field of large hydroelectric installations precludes an expression of our opinion. The decision has been made by the legislature and its duly authorized representative to whom the power was delegated. The record here discloses that they were thoroughly informed and capably advised and we are satisfied that the proposed contract is in accordance with the provisions of senate bill No. 268, supra."

"Therefore, as provided by said act, the court declares the contract above described to be valid."

Thereafter, on April 28, 1958, a person formerly serving as a member of the board of directors of the authority brought action for an interlocutory injunction in the U.S. court for the Northern District of Oklahoma, being civil No. 4487, naming the company, the authority, and numerous municipal corporations and REA cooperatives, as defendants, seeking to enjoin the execution and performance of the contract of August 5, 1957, under the Federal antitrust statutes

and alleging that said contract and its performance would violate the provisions of the 14th amendment to the Constitution of the United States. After full consideration of the merits of plaintiff's petition, the Honorable Royce Savage, judge of said court, dismissed the petition of plaintiff.

During June and July of 1958, a somewhat nebulous group operating under the name and style of Oklahoma Power Users Association, Inc., have prepared and issued a series of statements designed to be published in newspapers of the State and actually sent to newspapers in the hope that they would be published as news releases, with a series of ads which certain papers have published at their regular space rates for normal advertising. These advertisments have lampooned and criticized the parties to the contract, and the contract itself and have made a great variety of statements for which little or no factual basis can be cited. Various of these ads and news releases have quoted, at some times erroneously, from the original Beck report, from the Stueve report, from financial reports of the authority, and of the company and other statements have been made as statements of opinion by various of the parties included in the so-called association.

We believe it is a principle, long recognized by pyschologists, that an absolute lie, repeated long enough and often enough, will eventually come to be accepted as gospel truth. We would hesitate to dignify the criticisms of the program adopted by the authority by attempting direct reply to some of the tirades shown in these advertisements, but we feel that the matter should be called to the attention of the people, to the attention of the legislature and to the attention of the Governor so that any action deemed appropriate may be taken. Essentially, we feel that the public as a whole should be reminded of the long, careful, engineering, and economic studies and of the long period of negotiation gone through by the authority and its board and engineers before final signing of the contract.

They should be reminded also that the whole contract in all its details and the entire plan of the authority for future expansion of its system was presented to, passed on, and authorized by the legislature. Further, with respect to the legislature, it seems quite significant that in January 1959 the Oklahoma Legislature began its longest official session known in the history of our State, ending in July 1959, during which no effort was made by any member of the legislature to disturb the fulfillment of its plan approved and enacted into law during its 1957 session, although during the 1959 session both the senate and the house passed separate identical resolutions (S. Res. 51 and H. Res. 561), presumably under the prodding of opponents of the plan set out in the contract, in which Congress was memorialized to enact legislation which would (*a*) provide for construction of the Markham Ferry project by the Army Engineers "in general conformity with the recommendations of the Chief of Engineers, as contained in House Document No. 107 of the 76th Congress and House Document No. 758 of the 79th Congress, as a part of the comprehensive plan for the development of the Arkansas River Basin," (*b*) provide that all power and energy produced at both the Markham Ferry and Fort Gibson projects be sold to Grand River Dam Authority, (*c*) that operation of both said projects for power production be coordinated with power operation of the authority's Pensacola project, and (*d*) that rates for sale of such power to Grand River Dam Authority be fixed by the Federal Power Commission, but so as to recover amortization of actual investment in power producing facilities over the life of such facilities and so as to allow Grand River Dam Authority credit for all "power benefits" resulting at lower projects from Grand River Dam Authority's headwater improvements and storage at the Pensacola project. No bill related to this request has been introduced or passed in either House of Congress.

In line with the decision of the Supreme Court of Oklahoma, the company proceeded, under the provisions of section 10.1 of the contract, to file the contract as a rate schedule with the Federal Power Commission, and requested its approval. Extended hearings have been held before that agency, at which all interested parties in the State of Oklahoma have been freely permitted to appear and state their interests, positions, views, ideas, and objections, not only to the approval of the rates set out in the contract, but also to the terms of the contract itself, and even to the expansion plan of the authority the fulfillment of which is provided for by the contract.

Although it would seem obvious that the Commission could not reasonably be expected to alter or revamp the authority's plans for future development of its system, or to renegotiate and alter the basic terms of the contract between

authority and company, it has patiently permitted everyone who appeared before it expressing interest in the matter to state their views at length, and has granted numerous lengthy continuances to allow them time to prepare their material. In this way, more than a year has been consumed.

Under the Federal Power Act, the Commission is required, before approval of a rate schedule, to determine that rates and charges are just and reasonable, not unduly preferential, and not discriminatory. Testimony introduced by all parties appearing in the matter to date, considered from the standpoint of authority and company, establishes that the rate schedules set out in the contract meet the statutory standards set out in the act. The principal reasons which support this conclusion, are summarized as follows:

1. Continued independent (having no contract with company) operation of the authority's system would be both expensive and inefficient.

2. Coordination of the authority's system with the company's would provide the most efficient and economic use of the resources of both.

3. The agreement between the parties, embodied in the contract, is the result of strenuous bargaining at arm's length. The extent of the negotiations establishes prima facie the reasonableness of the contract terms.

4. From an operational standpoint, the provisions of the contract for the coordination of the two systems and the maximum use of the authority's hydroelectric resources on the combined system peaks permit the maximum efficiency of service for the customers of the authority and the company and constitute an integration of facilities that is clearly in the public interest.

5. The rate provisions of the contract are so inextricably interwoven with the energy exchange and service provisions, together with the intangible benefits to both parties, as to be insusceptible of separate analysis, but nevertheless, the rates are just and reasonable. Testimony submitted for the authority showed that its cost of producing peaking capacity averages $11 per kilowatt per year, which it sold under the contract at $12 per year, a profit of 9.2 percent, so the authority suffered no inequity. Testimony by representatives of the company, and by independent, nationally known rate experts, showed that company could expect to earn only 0.98 percent after taxes, during the initial years, but after Markham Ferry and the pump-back units are installed, this earning would gradually increase to approximately 4 percent, thus the rates of return company may expect to earn from year to year are not excessive or unreasonable, nor do they constitute a burden upon other customers of company.

6. The rates charged by the authority to its customers other than company, although not subject to the jurisdiction of the commission, have been demonstrated to be just and reasonable.

7. The issue involved in the proceedings before the Federal Power Commission relates only to the reasonableness of the rates at which the parties to the contract buy, sell, or interchange power, and the question of renegotiation of the contract the parties have made is not before the Commission.

CONCLUSION

This record, in all its details, shows that the authority has at all times proceeded in a thorough, painstaking, and lawful manner, to negotiate a sound, businesslike contract, to implement and provide for the fulfillment of a comprehensive long-range plan of system expansion which it has undertaken to enable it to discharge the obligations fixed upon it by the Oklahoma Legislature, and which is definitely in the public interest. Certainly every fair-minded public-spirited citizen of Oklahoma should support the program of the authority and lend all aid to speed its execution.

Colonel WILSON. We have one final witness in this category. We have the honor of having Mrs. Roger C. Fletcher, the Oklahoma State water chairman of the League of Women Voters. We will ask Mrs. Fletcher to testify.

The CHAIRMAN. Come around. We know this committee admired the rugged men who have been here and also the very charming lady that is now before us. Mrs. Roger C. Fletcher, Oklahoma State chairman, National Item II, League of Women Voters of the United States.

STATEMENT OF MRS. ROGER C. FLETCHER, OKLAHOMA STATE CHAIRMAN, LEAGUE OF WOMEN VOTERS

Mrs. FLETCHER. Thank you, sir.

The League of Women Voters appreciate the opportunity to express its views to this group.

The league witnesses have been most impressed and appreciate the courtesy and consideration shown them by this Senate select committee.

We especially thank you for taking your so-called vacation time to bring Washington to us so that we can have a feeling of participating actively in our Federal Government.

By now you are well-acquainted with the League of Women Voters' interest in water and know we are not attacking this as specialists, but as citizens interested in our Nation and its future. We do not pretend to have much technical information tucked under our sometimes funny-looking hats, but we want to help anyway.

With the exception of pollution I will omit all the general water information and studies that we have made.

Since pollution abatement is in its infancy, Federal assistance as an incentive to reduce pollution is most welcome. Surely pollution is as much a Federal concern as flood control for the life of the Nation itself is dependent on good-quality water.

As a result of its studies the league feels that the river basin is the place to begin comprehensive planning of water resources. In fact, you have encountered this before.

Our national agenda item is—

support of those national policies and practices which promote coordinated administration, equitable financing and regional or river basin planning.

Fortunately through the instigation of one of your members we have just such an organization in the Arkansas-White-Red Basins Interagency Committee.

The league believes that the efficiency of cooperation of all levels of government is evidenced in the AWRBIAC but to make the best use of its abilities it lacks a few points. They are:

1. Lacking in congressional legislation, it operates under a charter from ICWR.

2. Lacking in authority to mutually resolve problems that arise under differing legislation, it cannot achieve the best development possible for the available water.

3. Lacking a central library, program information, basic data collected and interpreted is not readily available to other groups who are affected in the discharge of their duties by water development projects.

4. Lack of publicity for problems resolved limits the public understanding of the cooperation and coordination of the agencies. Even within the league itself there is a strong feeling between upstream and downstream enthusiasts as to the best way to prevent floods. This concept of conflict between the agencies is greatly magnified in the public mind, and it is not alleviated any when there is no publicity to the contrary available.

The joint cooperative efforts of the Soil Conservation Service and the corps and the Bureau of Reclamation and the Corps of Engineers and the Soil Conservation Service and the corps itself is not found anyplace except in the minutes of the AWRBIAC meetings.

5. Lack of planning funds independent of agency appropriations delays development. The Trinidad project on the Purgatoire River is an excellent example and is contained in the filed report.

If we were to extend the framework of the AWRBIAC beyond the river basin level, Senator Murray's bill, Senate bill 2549, is one that the league plans to support. It would provide for regular navigation route of water program information both going upstream from the river basin level and coming downstream from the executive and legislative branches of the Government.

It would provide a means for communicating between and among all levels of government to achieve greatest efficiency in developing our water resources.

We look to this Senate select committee to recommend legislation to provide future generations with water and it is in the area of educating the public as to the necessities for these developments that the league does its best work or we go into neighborhoods for discussion groups and contact people that few men's organizations reach.

In the legislation that we are sure will come from the recommendations of this committee, the League hopes to be of assistance to you.

Thank you.

(The prepared statement follows:)

STATEMENT BY MRS. ROGER C. FLETCHER, OKLAHOMA STATE CHAIRMAN, NATIONAL ITEM II, LEAGUE OF WOMEN VOTERS OF THE UNITED STATES

Reports coming back to us from the national office of the League of Women Voters highly praise the Senate select committee attitude and courtesies toward the league members who have testified. To listen to us is a compliment for we do not present too much technical material, so to include us for testimony is most considerate. We appreciate most of all, though, the fact that you are taking your so-called vacation time to bring Washington to us, so that we may have a feeling of actively participating in our Government's problems and hope that we can feel that we have had a part in forming our Nation's future. We appreciate the opportunity to express our views.

By now you are well acquainted with the League of Women Voters and their interest in the water resources of the United States. You are aware, also, that we are not attacking this problem as specialists, but as citizens interested in our Nation and its future. Our item, as worded on our national agenda is "Support of those national policies and practices which promote coordinated administration, equitable financing, and regional or river basin planning." This, the league feels, expresses the sentiments of the citizen interested in resource development, and since other participants here can provide technical information on various phases, I will confine most of my remarks to the area not covered by others at this hearing.

In our study throughout the State we have found that Oklahoma, as a whole, presents several contrasts with the problems found in most of the western States. Instead of having a limited water supply, we have an abundant source of good-quality water. There is a problem involved, however, for the source of this particular supply is in the southeast corner of the State and the area where it is needed is toward the northwest of that point. The problem, then, is to lower the northwest corner so that the water flows by gravity to where it is needed or else the same effect created by artificial means.

In contrast to States which argue about how much water each is entitled to, our neighboring State of Arkansas would be happy for us to keep a great deal of our water, for they have all they can do to manage their own. In water quality, pollution of streams in our State is not confined to municipalities and industries but is provided with abandon by nature itself. In addition, sedimentation makes water quality a definite concern. Since pollution abatement is still in its infancy, Federal assistance as an inspiration to reduce stream pollution is most welcome. Surely, pollution abatement is as much a Federal concern as flood control, for the life of the Nation itself is dependent upon good quality water.

The League of Women Voters, as a result of its studies, feels that the river basin is the area in which to begin comprehensive planning and development of water resources. There may be another medium developed which would be better, but so far, this type group cooperation is recommended as being the best. Fortunately, through the instigation of one of your members, just such an organization exists in the Arkansas-White-Red Basins Interagency Committee.

We believe you will find the efficiency of coperative local, State, and Federal planning and development is evidence in the AWRBIAC. The benefits are revealed in the compilation of the facts of the study which provides the framework around which future developments can be centered and the program exchange and basic data collection that constitutes the present role of the AWRBIAC.

But the AWRBIAC, like most things, lacks a few points which would, perhaps, make it more efficient. Itemized, they are—

1. Lacking in congressional legislation, it operates under a charter from ICWR.

2. Lacking in authority to mutually resolve problems that arise under differing legislation, it canont develop the best use possible for the available water. No directive setting out a policy to resolve these problems has been available.

3. Lacking a central library, information for project plans is not readily available to the other interested levels of government. Access to such a library would permit more efficient discharge of duty for groups connected with water resource development. Basic data collected could be housed in a central library also, thereby being accessible for all interested groups.

4. Lack of publicity for problems resolved limits the public understanding of the cooperation and coordination between the agencies. To elaborate, there exists, even within the league, a strong feeling between upstream-downstream enthusiasts as to the best way to prevent floods. This concept of conflict between the Corps of Engineers and the Soil Conservation Service is magnified greatly in the public mind and, with little publicity to the contrary available, is not being alleviated. If the public understood the purpose of each individual agency, much controversy would not exist. Specifically, a report of the joint cooperative efforts of the SCS, the BR, and the Agriculture Research Service, given at a recent AWRBIAC meeting, contains valuable information about one of Oklahoma's upstream projects. Publicity of AWRBIAC program reports would do much to reduce the contention that there exists a controversy between the agencies as to the best means of flood control.

5. Lack of planning funds independent of agency appropriations limits effectiveness of obtaining best comprehensive development without the handicap of time lapse between instigation and completion. If Congress should establish the AWRBIAC as a permanent agency, could it be provided with funds to be disbursed for cooperative planning by the agencies? The example in mind is the Trinidad project on the Purgatoire River in Colorado. Originally a channel improvement investigation request for Trinidad, the Corps of Engineers, and the Bureau of Reclamation, by working together, have evolved a plan for one dam with both flood control and irrigation, transferring the water storage rights from two silted-up lakes to the one new lake that would provide a dependable supply for irrigation, pollution abatement, recreation, and fish and wildlife use. It would also provide flood protection that the channel improvement could not do. Lacking only the funds to finish the planning to determine which one of two proposed locations would be the better, the whole program cannot proceed unless planning money is made available by both agencies simultaneously.

6. Lacking enough technically trained men to serve on committees, the role of State participation on AWRBIAC is limited. Although the appointee by the Governor is a trained man, he does not have the time to work on many committees, so the State role is not as strong as it could be.

Extending the purpose of the AWRBIAC framework beyond the regional area, Senator Murray's bill, S. 2549, is one that the league plans to support. Establishment of a council of advisers in the White House and a joint committee in the Congress would provide for a navigation route of water program information, both going upstream from the river basin level and coming downstream from the executive and legislative branches. Furthermore, an up-to-date report each year will clear away many fogs arising from the present piecemeal approach to an annual accounting of water resource development in the Nation. It should provide a means of communicating with and among all levels of government to

achieve the maximum development of our water resources with the greatest efficiency.

We look to this Senate select committee to recommend to Congress legislation that will adequately provide for future generations. To educate the public on legislation maters is one obstacle in Government and the most tedious to perform. It is in this area that the League of Women Voters provides its greatest service, for by going ino the neighborhoods for discussion groups, we reach citizens that other organizations seldom reach. We hope that we will be of assistance to you in the legislation that will arise from the efforts of your committee.

Colonel WILSON. Thank you Mrs. Fletcher.

The CHAIRMAN. Let me interrupt there.

The League of Women Voters has had intelligent, constructive statements at each of the hearings that this committee has held.

You who have heard Mrs. Fletcher—well, you have heard one of the finest. You have been permitted to learn the character of the original and challenging thinking of this group of citizens. We, now, are receiving the benefit of it.

We very greatly appreciate your presence, Mrs. Fletcher, and the record will reflect not only your summary but your entire statement.

Colonel WILSON. The Mississippi Valley Association's statement which was to be filed for your committee at this hearing, Senator, will be filed in Alexandria, La., and I was asked to convey that word to you.

The CHAIRMAN. Fine.

Colonel WILSON. In turning this back to you, Senator, I want to tell you how much we appreciate your being here and we know that this, probably the greatest problem that now faces our Nation, is in as capable hands as we could find. I give it back to you.

The CHAIRMAN. Thanks very much, Colonel.

We are going to recess for one of the very appropriate and necessary functions of daily routine, the matter of a daily lunch downtown. The first witness after lunch will be another of Oklahoma's great women leaders in conservation. She was conservation chairman for the Garden Clubs of Oklahoma and also I call her "Mrs. Soil Conservation."

Mrs. Paul Mungle will be our first witness after lunch.

As I understand it now there is a bus out here to transport the members of the committee and staff down to the Skirvin Towers for the lunch. It is my hope that we will be able to proceed again at 1:45, and we will stand in recess until that time.

(Whereupon, at 11:45 a.m., Monday, November 30, 1959, the committee recessed until 1:45 p.m. the same day.)

AFTERNOON SESSION

The CHAIRMAN. The hearing will be in order.

We will hear now from Mrs. Paul Mungle.

STATEMENT OF MRS. PAUL MUNGLE, CONSERVATION CHAIRMAN, GARDEN CLUBS OF OKLAHOMA

Mrs. MUNGLE. Mr. Chairman and members of the committee, I am State conservationist for the Garden Clubs of Oklahoma, of which there are 12,000 members. In the past 3 years I have had the pleasure and the duty of naming the speech and the poster contest.

The first year it was "Stop Water Erosion." This is the poster from the first through the ninth grade. The speeches were from the 9th, 10th, and 11th grades.

On "Stop Water Erosion" one boy said, "You began to fill the greatest reservoir we have, the earth."

Next was water conservation. One boy asked, "If a man cannot control the water where it falls how is he going to control it 100 miles downriver?"

This year the title is "The Damage by Floods in Oklahoma."

I wish it were possible that you could hear these young people talk on these subjects.

Now you know you are going to have water problems in 1980. We are going to have them in 2000. By then the people who are sitting in this Senate today will be these youngsters. Yes, we should be educating our youngsters, sometimes through the women, the mothers, the grandmothers, of saving the water and soil for themselves. I certainly believe that we cannot start too young on this problem of teaching our young people to conserve the soil and the water.

Now there is no practical way of conserving our water without conserving our soil. The land treatment measures must be applied on all watersheds in order that our lakes will be filled with clear water and not be filled with silt and soil from the land. Therefore our cover crops must be protected from fire which is doing so much damage in our State.

Then, are we not making a serious mistake in our upstream flood control by not making our dams larger and considering the need for more usage of water which is sure and certain?

Yes, dams, more dams; lakes, yes, more lakes, but the cover crop of our land will slow our water into the greatest reservoir we have—the earth.

If the reservoir in the earth is full, and it has been, and it can be again, there will be water underground, water for people who seek the underground water. The lakes, the big lakes, furnish the people of our country with water. Therefore, we stop the water and we use it.

I know we say when, where, how much—how much water will it take for our people?

Naturally, I am concerned with the water in Oklahoma. It will take all the water that falls and runs through Oklahoma that should be impounded, used, and reused before it goes into the ocean.

Other States do likewise. Saving the water where it falls will put more water in that great reservoir where it is needed.

I would say that I am in earnest in teaching our young people this very important project of conserving our water because they will soon be sitting in your chairs and we can start no earlier than even a first grade pupil to conserve our water.

The Bible says, "Little children shall lead us."

The CHAIRMAN. Thank you very much. Thank you very much, Mrs. Mungle.

I think you are not only a great value to this program but the entire State of Oklahoma. We appreciate your being here and the statement you have given us.

Now Mr. Forest Nelson is in charge of this panel and he is to call the witnesses that he has to testify.

STATEMENT OF FOREST NELSON, ASSISTANT DIRECTOR, WATER RESOURCES BOARD, OKLAHOMA PLANNING AND RESOURCES BOARD

Mr. NELSON. Mr. Chairman, Senators, ladies, and gentlemen, we must move with dispatch. Take 3 to 5 minutes in the witness chair so that we will hear as many of you people as possible.

First, I want to call on Louis Hawkins of OSU, representing Dr. Oliver S. Willham.

Mr. Hawkins.

STATEMENT OF LOUIS E. HAWKINS, DIRECTOR, OKLAHOMA AGRICULTURE EXPERIMENT STATION, REPRESENTING DR. OLIVER S. WILLHAM, PRESIDENT, OKLAHOMA STATE UNIVERSITY

Mr. HAWKINS. My name is Louis E. Hawkins. I am director of the Oklahoma Agriculture Experiment Station.

May I present to you my colleague, the dean of resident instruction in agriculture, Dr. Randall J. Jones.

President Willham conveys his regrets to us of his inability to be here today. He is in the big town up on the Great Lakes, Chicago, helping along, Senator, as best he can in the steer show where our hopes of the pennant for Oklahoma are pinned on various steers of at least three breeds, most prominent of which is one without horns and black in color.

This statement I am privileged to present on his behalf.

STATEMENT OF OLIVER S. WILLHAM, PRESIDENT, OKLAHOMA STATE UNIVERSITY, STILLWATER, OKLA.

Gentlemen of the committee, thank you for this opportunity to appear before you and to file for the record this brief statement on the subject of your hearing, a subject of utmost importance to all of the people of our Nation.

Water has become more vital as agricultural, industrial, municipal, recreational, and other uses for this essential resource have increased in number and expanded in magnitude. Further increases in human population, with attendant greater demands for water as indispensable among the resources required to produce, manufacture, and otherwise make available to mankind the goods and conditions to meet human needs and requirements, will further intensify the struggle for larger and larger available supplies of this element.

Great quantities of the water which falls annually on Oklahoma's 44 million acres are lost in runoff, often with associated damage to land and other property, because of our inability to catch and hold this water nearer where it falls.

One year of average rainfall in Oklahoma would be equal in quantity to 130 Lake Texomas at spillway level. Southerly winds from the Gulf of Mexico will continue to bring moist air over our lands for ages to come, and cool air masses from the Rocky Mountains and Canada will precipitate that moisture as rainfall over centuries uncountable.

Conservation of a fraction of this precipitation in Oklahoma by improved penetration in the soil where it falls, by retention ponds and reservoirs on the slopes of the watersheds and by larger reservoirs on the main stems of certain of our streams offers great promise for increasing the availability of this vital resource.

Speaking for Oklahoma State University, the great land-grant institution which it is my honor to represent, and for myself as a citizen of this great country of ours, I want to express sincere appreciation to the men of your committee for this fine service of ascertaining the facts upon which a sound water policy may be projected by the Senate of the United States.

Oklahoma and the Southern Plains area of which our State is a part have an enormous stake in this matter. We shall be deeply grateful, as will genera-

tions after us, for the vision, judgment, and courage which we are certain you gentlemen will exercise in developing a policy fair and equitable to all interested groups and assuring conservation and efficient use of this vital natural resource.

Thank you, sir.

Mr. NELSON. Our next witness is Judge Lavern Fishel. He is president of the Oklahoma Association of Soil & Water Conservation Districts.

Judge Fishel.

STATEMENT OF JUDGE LAVERN FISHEL, PRESIDENT, OKLAHOMA ASSOCIATION OF SOIL & WATER CONSERVATION DISTRICTS

Judge FISHEL. Senator Kerr and gentlemen of the committee, this statement is submitted jointly and in behalf of the Oklahoma State Soil Conservation Board and the Oklahoma Association of Soil & Water Conservation Districts.

We respectfully request of the committee that we may be permitted to file a more detailed statement at a later date.

The CHAIRMAN. We will be very happy to have you do that, Judge.

Judge FISHEL. Thank you, Senator Kerr.

We are grateful for the opportunity of appearing here today. Much good can come as a result of this study. Nothing could be more timely or important to the welfare of this Nation and the people than how best to develop and utilize our water for the beneficial use of mankind.

We are limiting our presentation to the small watershed program. A detailed statement will be submitted dealing with all phases of this program such as fish and wildlife, recreation, ground-water recharge, pollution abatement, agricultural use, irrigation, municipal, and industrial use.

Basically, the purpose of the small watershed program is to conserve water by retaining a maximum amount of it on the land where it falls and to retard agricultural damages caused by runoff in a watershed. A secondary objective of the small watershed program is to complement mainstream works, such as large dams, levees, and dredged channels, by restricting the flow of water during periods of maximum runoff and reducing sedimentation and excessive siltation of the beds of reservoirs and streams.

This program is visualized as a part of flood control as well as a foundation for stabilized agricultural production, especially in areas subject to alternating drought and floods such as Oklahoma.

Since the enactment of the Watershed Protection and Flood Prevention Act (Public Law 566), tremendous interest has been evidenced by the local people and as the benefits to be derived from this program become more apparent by comparison of treated watersheds and those untreated during some of Oklahoma's most devastating floods, aroused interest continues to spread over Oklahoma as a prairie fire.

Seventy-two applications for assistance under Public Law 566 now are on file with the Oklahoma State Soil Conservation Board embracing approximately 8,500,000 acres.

Applications continue to be filed at approximately 15 per year. Increased appropriations for watershed planning by the 27th Okla-

homa Legislature in 1959 is in direct response to the increased interest and demands of the local people.

Back in the 1930's, during the Dust Bowl days, when entire farms were being blown away practically overnight, the Nation became aware of the needs of soil conservation. During this national catastrophe, organized efforts to conserve our soil was activated.

Likewise, during the drought years of more recent date when agricultural cities and towns were experiencing critical water shortages, the Nation took a new look at what needed to be done to develop and utilize our water for the beneficial use of mankind.

This, even today, is more important because of the increased consumption of water and the rapid increase in population. Demands for pure and usable water will be greater with each passing day.

We believe that in the future, greater emphasis and importance should be given to upstream flood prevention projects both on a State and National basis. It is a vital part of, and cannot be separated from the overall water development program.

As our country grows the various segments of our society become more interdependent. Agriculture cannot stand alone. Neither can a town or a city. They decline or prosper together. What happens to raindrops that fall in the upper reaches of a small watershed affects the man in town as much as it does the farmer.

We trust this committee will give major consideration to the role that farmers and ranchers can play in managing the water resources of our country. Water conservation and management starts where the raindrops fall—on the farm and range lands in small agricultural watersheds.

Thank you.

Senator HART. Thank you very much.

Mr. NELSON. Is Lewis Munn in the room?

Lewis Munn, president of Oklahoma Farm Bureau, will file a statement with the committee.

(Statement referred to follows:)

STATEMENT OF OKLAHOMA FARM BUREAU, BY LEWIS H. MUNN, PRESIDENT

Gentlemen of the committee, my name is Lewis H. Munn. On behalf of Oklahoma Farm Bureau, I want to take this opportunity to express our appreciation for the privilege of filing a statement on this very important subject.

Oklahoma Farm Bureau, representing a membership of more than 40,000 farm families in Oklahoma, has a vital stake in the protection and development of our water resources.

There have been and will be, of course, other statements presented to your committee at this hearing from the Governor and from the technical staff of the Oklahoma Water Resources Board outlining the nature of the terrain of Oklahoma, the average annual rainfall in different sections of Oklahoma, streamflow in Oklahoma, and, of course, other groups will present the nature and extent of water requirements for municipal and industrial purposes. In the interest of brevity therefore we shall not undertake to duplicate any of the factual data which will undoubtedly be contained in the other statements.

The two points which our people are most interested in, and which they are most anxious for us to stress, are:

(1) The necessity for upstream flood control and water conservation; and

(2) The protection of individual land and water rights under Oklahoma law against Federal encroachment under the guise and theory of "Federal supremacy."

(1) NECESSITY FOR UPSTREAM FLOOD CONTROL AND WATER CONSERVATION

In support of our position emphasizing the necessity for upstream control of water, we quote herewith a few of the resolutions which have been adopted by the voting delegates of Oklahoma Farm Bureau in recent conventions.

1958

"In order to prevent erosion and recharge subsurface gravel beds, we recommend the expansion of program to impound and contain water where it falls by means of contours, terraces, grassed areas, and small upstream lakes.

"We recommend that the requirements for construction of upstream flood prevention projects be liberalized and that the number of projects undertaken for planning be expanded and increased immediately."

1957

"We recommend that the board of directors of the Oklahoma Farm Bureau take any action they deem necessary to resist and oppose any efforts which may be made to amend or repeal the present provisions of the smaller watershed law and the amendment thereto, which provides for upstream flood control and conservation, with the cost thereof shared by the landowner and the Federal Government."

1956

"We urge continued support for upstream flood control and water erosion projects."

1955

"Realizing the need for upstream flood control and realizing that this can best be accomplished by containing the water in the area where it falls, we recommend that ASC include payments for construction of farm control ponds in the present conservation program."

These are a few of the resolutions which point up the interest of the farmers of Oklahoma in upstream flood control; and all of which resolutions were reaffirmed at the 1959 convention which was held in Oklahoma City this month.

As an additional indication of the attitude of our people toward large dams and reservoirs which completely obliterate thousands of acres of fertile land, we feel it pertinent to quote two additional resolutions:

1959

"Each year we assemble, it seems that we are faced with another attempt by the Federal Government to take the lands of farmers and ranchers of Oklahoma for some purported worthy project. This year the farmers of Kay County are faced with the attempt to acquire 42,000 acres of fertile land for the construction of the Kaw Dam and Reservoir. We therefore resolve to do anything practicable, within the limits of the policies of our organization, to support and assist the Kay County Farm Bureau in its resistance to this unnecessary taking of land."

1958

"We recommend that a lock system for the proposed Arkansas River navigation project be substituted for the proposed Short Mountain Dam. The present plan will flood the lands of approximately 375 landowners in Sequoyah County in Oklahoma and inundate approximately 42,000 acres of river bottom land."

The farmers of Oklahoma are extremely conscious of the need for preserving our water for its greatest utilization. They realize that it requires 420,000 gallons of water to produce 35 bushels of wheat; 281,000 gallons to produce 1 bale of cotton; and 225,000 gallons of water to produce 1 ton of alfalfa. They are extremely conscious of the need for flood control; but they are convinced that a more concentrated effort in the development of farm ponds, terraces, and the recharging of our underground water levels through insoak methods should not be neglected, but should be expanded under the provisions of the Watershed Protection and Flood Prevention Act.

We think it is significant to note that at the present time approximately $25 is being appropriated for downstream work, for every $1 appropriated for work in the upper headwaters.

(2) THE PROTECTION OF INDIVIDUAL LAND AND WATER RIGHTS UNDER OKLAHOMA LAW AGAINST FEDERAL ENCROACHMENT

The concern felt by our membership with respect to continued encroachment by Federal agencies on individual land and water rights is illustrated by three resolutions of our voting delegates adopted in 1958:

"23. We recommend that Congress enact legislation recognizing and respecting the established water laws within the various States wherein the Federal Government owns land, and requiring Federal agencies to respect the correlative property rights of adjoining water users.

"24. We challenge the claim of the Bureau of Reclamation to all water in the Washita watershed to the extent that it conflicts with existing appropriators or riparian users; and we favor repeal of title 82, section 91, Oklahoma Statutes.

"26. Recent Federal court decisions have revealed an alarming tendency to ignore State laws relating to water rights. Additional decisions in this direction could seriously impair the effect and validity of the water laws of the State of Oklahoma and the vested rights of individuals and other users thereunder. We therefore urge that Congress adopt appropriate legislation which will prevent further invasion by judicial decree of State water rights which have been or may be established by the sovereign States; and further that any water compact which may be entered into by two or more States which does not adversely affect any other State shall be forthwith approved and recognized by Congress."

As the committee is aware, on March 3, 1877, Congress passed the Desert Land Act, which definitely reaffirmed the rights of the States to legislate on all matters concerning inland or nonnavigable waters within their borders. This is still the statutory law. Under this act, the water rights of individuals were to be determined by State law. By a comparatively recent series of Supreme Court decisions, however, notably the *Appalachian Power* case, the *Ashwander* case, and particularly the *Pelton Dam* case, with which the committee is familiar, the intent of Congress has been thwarted in that these decisions have deprived the States of effective control over their water resources.

This is a vital matter in which not only the State of Oklahoma is extremely interested but in which all of the sovereign States of the Union are seriously concerned.

To correct the severe injustices which may easily result from these decisions, the American Farm Bureau has sponsored a water rights bill which is now pending in the Senate, being S. 1416. We are also interested in H.R. 3, which was introduced in the 86th Congress (passed by the House and now pending in the Senate), which is specifically known as the States rights bill, and which would provide in substance that no Federal law or court decision shall take priority over State law unless Congress decides that it should do so.

We sincerely trust that each individual member of this committee, whenever the opportunity arises, will be able to give favorable consideration and action to these measures.

CONCLUSION

Oklahoma Farm Bureau is not unmindful of the growing concentration of population in the municipalities, and in the growing and expanding industries of Oklahoma, and the need of both municipalities and industry for flood protection. We also recognize and concur in the belief that if Oklahoma is to properly and effectively develop its natural resources and maintain its economic standing among the 50 States of our Union, our industries and municipalities must be protected from the destructive forces of floods; and that water, our greatest resource, must be conserved and properly used. The purpose of this statement, however, is to remind the committee that in the increasing crescendo toward crash programs for large dams and reservoirs, that the real secret of flood control lies back on the plains, on the farms, in the pastures, in the forests, in the ravines, and at the headwaters of the large streams; and that at least equal attention and consideration should be given to upstream control measures.

We further wish to emphasize that no project, and no governmental effort, regardless of the zeal of its sponsors, the magnitude of its concept, or the merits of its accomplishment, can justify the destruction or impairment of the rights of the individual citizen and his State.

Mr. NELSON. Jim Bullard, former speaker of the house of representatives and president of the Beaver Cow Creek Watershed Development Association.

Jim.

STATEMENT OF J. M. BULLARD, PRESIDENT, BEAVER COW CREEK WATERSHED DEVELOPMENT ASSOCIATION

Mr. BULLARD. Mr. Chairman and members of the select committee, I am representing the Beaver Cow Creek Watershed Development Association down in southwest Oklahoma in Jefferson, Stevens, Cotton, and Comanche Counties on a project known as the Waurika project which is a reservoir to be located approximately 6 miles north and west of the city of Waurika in Jefferson County.

This is a multiple-purpose project for municipal, industrial water, and for flood control, irrigation and also for the benefit of fish and wildlife and recreation.

Due to the short time that we have I am not going to try to read the figures nor all of the data. I would like to file with the committee the proposed report of the director of reclamation which we will leave with the committee and also an economic base study of the Wichita Mountain area by the University of Oklahoma.

But the feasibility report would show to you that this is an economically feasible project, but it would furnish water to the cities of Lawton, Walters, Temple, Waurika, Comanche, Duncan, and the D–X Sun Ray Refinery.

Also we would hope that this committee would study the report that does show it to be feasible, which is completed, and I would like to file it with the committee.

The CHAIRMAN. Thank you very much, Mr. Bullard.

We will be glad to have it.

(The material referred to follows:)

DATA SHEET, WAURIKA PROJECT, OKLAHOMA

October 16, 1959

LOCATION

Waurika Reservoir would be located near Waurika, in southwestern Oklahoma, on Beaver Creek, a tributary of the Red River. The municipal and industrial needs of Lawson, Duncan, Waurika, Comanche, Temple, and Walters, Okla., and the D–X Sunray refinery would require three separate aqueduct systems extending about (1) 36 miles northwest, (2) 20 miles northeast, and (3) 5 miles south of Waurika Dam site.

Project lands are located along the north side of Red River near its confluence with Beaver Creek about 17 miles downstream from Waurika Reservoir.

PLAN

The Waurika project consists of the Waurika Dam and Reservoir which would regulate the flows of Beaver Creek in southwestern Oklahoma, an aqueduct system about 61 miles in length to deliver new or supplemental municipal and industrial water supplies to Lawton, Duncan, Waurika, Comanche, Temple, and Walters, Okla., and the D–X Sunray refinery, and canals, laterals, drains and other works required to deliver irrigation water to 2,000 acres of land suitable for project type development. It would also provide substantial flood control benefits, and desirable fish and wildlife and recreational opportunities.

Construction costs

Waurika Dam and Reservoir	$12,914,400
Municipal and industrial aqueduct systems	10,080,000
Waurika, aqueduct system	319,000
Reservoir pumping plant	388,000
Lawton aqueduct system	6,399,000
Duncan aqueduct system	2,974,000
Irrigation works	752,500
Pumping plants	278,500
Main canal	290,000
Laterals	107,000
Drainage system	77,000
Recreational facilities—Federal	[1] 367,500
Fish and wildlife program	905,100
Wildlife management area	457,200
Waterfowl refuge area	447,900
Total Federal project costs	[1] 25,019,500

[1] Does not include $400,000 of non-Federal costs for accessory recreational facilities recommended by the National Park Service.

Cost allocation and repayment

[Thousands of dollars]

Function	Construction cost	Interest during construction	Capital cost	Nonreimbursable	Reimbursable	Repayment
Municipal water supply	15,856.5	680.3	16,536.8	0	[1] 16,355.4	[1] 19,721.4
Irrigation	4,044.3	200.4	4,244.7	0	[2] 4,018.5	[2] 652.5
Flood control	2,264.8	124.9	2,389.7	2,389.7		
Fish and wildlife	2,486.4	87.9	2,573.8	2,573.8		
Recreation	367.5	0	367.5	367.5		
Total	25,019.5	1,093.0	26,112.5	5,331.0	20,373.9	20,373.9

[1] Includes adjustments for contributions made by project interests and for flood control and fish and wildlife reservoir operation, maintenance, and replacement which would be incurred by the repayment organization.

[2] Includes adjustments for incremental construction cost and operation, maintenance, and replacement for special trashracks on irrigation pumps requested by the Fish and Wildlife Service.

Payment requirement (over 55-year period)

[Thousands of dollars]

Function	Construction cost	Capital cost	Interest 2½ percent	Operation, maintenance, and replacement	Total
Municipal water supply		16,355.4	13,608.1	8,355.5	38,319.0
Irrigation	4,018.5			1,182.5	5,201.0
Total	4,018.5	16,355.4	13,608.1	9,538.0	43,520.0

	100-year period	50-year period
Average annual benefits:		
Total	$2,185,000	$2,206,000
Direct only	$2,217,200	$2,244,300
Annual economic costs	$886,500	$1,089,600
Benefit-cost ratio:		
Total benefits	2.47	2.02
Direct benefits only	2.50	2.06

Municipal water supply

[Million gallons per day]

Potential user	Estimated demands and deliveries		
	1965	2015	Average
Lawton	0	16.0	9.6
Duncan	2.2	7.0	5.0
D-X Sunray Refinery	2.0	6.0	5.6
Waurika	.3	3.9	2.5
Comanche	.1	.5	.3
Temple	.2	.4	2.9
Walters	0	1.0	.5

Average annual water charge:	
Total	$748,100
Equivalent unit rate (cents per 1,000 gallons) all water delivered	8.40
Irrigation:	
Project area (acres)	2,000
Consumptive use requirement (acre-feet per acre)	2.57
Average annual effective precipitation (feet)	1.49
Average annual irrigation requirement (acre-feet per acre)	1.08
Average annual diversion requirement (acre-feet per acre)	2.57
Average annual payment capacity (per acre)	$23.07
Estimated annual O.M. & R. costs (per acre)	$10.75
Average annual amortization capacity (per acre)	$12.32
Assumed annual construction cost payment (per acre)	$7.25
Dam:	
Stream	[1]
Type	[2]
Maximum height above streambed (feet)	93
Volume (cubic yards)	5,460,000
Crest:	
Elevation (mean sea level in feet)	982.0
Length (feet)	14,500
Width (feet)	30
Spillway:	
Type	[3]
Capacity (cubic feet per second)	4,550

[1] Beaver Creek.
[2] Rolled earth.
[3] Uncontrolled glory hole.

Reservoir

	Elevation (feet, mean sea level)	Area (acres)	Capacity (acre-feet)	
			Total	Allocation
Crest of dam	982.0			
Maximum water surface	975.4	22,072	545,100	
Surcharge storage				294,800
Top of flood control pool	958.4	13,291	250,300	
Flood control storage				95,300
Top of conservation pool	950.0	9,315	155,000	
Conservation pool				155,000
Sediment and dead storage				40,000
Streambed	889.0	0	0	

Hydrology

Drainage area at damsite (square miles)	562
Annual runoff at damsite (acre-feet):	
Average (1926–57)	95,100
Maximum (1957)	252,500
Minimum (1939)	5,700
Discharge at damsite (cubic feet per second):	
Average	131
Peak	65,300
Minimum	0
Inflow design flood (3 day):	
Volume (acre-feet)	325,000
Peak discharge (cubic feet per second)	196,000

Mr. NELSON. Our next witness is Barbour Cox from Chandler, representing the Deep Fork Watershed Association.

STATEMENT OF BARBOUR COX, REPRESENTING THE DEEP FORK WATERSHED ASSOCIATION

Mr. COX. Senator Kerr and Members of the select committee, my name is Barbour Cox, from Chandler, and it is my privilege this afternoon to represent the Deep Fork Watershed Association which is composed of volunteer farmers, ranchers, businessmen, and others—dedicated to the purpose of helping the various watersheds on Deep Fork River to carry out the following objectives:

1. Reduction of floodwater and sediment damages through land treatment and detention dams on Deep Fork and its tributaries.

2. Assist the people in the watershed to understand the need for and the benefits that can come from a watershed protection program.

3. Encourage landowners in each subwatershed to organize and make use of help available through the watershed protection program, Public Law 566.

Seven counties are involved in this watershed. They are: Oklahoma, Logan, Lincoln, Creek, Okfuskee, Okmulgee, and McIntosh. There are 18 separate watersheds involving a drainage area of 1,461,452 acres.

To give you gentlemen an idea of the damage that the silting up of the Deep Fork Valley has done, we estimate that just in Lincoln County alone we have lost some $400,00 worth of pecans each year. In 10 years this would amount to $4 million. We are told that for every $1 spent in a town, multiplies seven times in its course of travel. Thus, every 10 years from the loss of such a cash crop as pecans we actually are the losers by $28 million.

The assessed valuation of Lincoln County is only $22 million so we can readily see why it is so vitally important that we get this siltation process—the "cancer of Deep Fork Valley"—because of its insidious eating away at our very finest farmlands.

The only way we know of to stop it is through our watershed treatments with the small structures combined with the land treatments above the structures. This operation seems to us to be a proper wedding of the big dam programs and the watershed programs because certainly the big dams cannot be 100 percent successful unless we control the sedimentation further upstream.

In this case, we have a large part of our total watershed draining into the very important Eufaula Reservoir. After we have com-

pleted all or a sizable part of our upstream work we will need the help of the Federal Government in properly dredging Deep Fork so that we can then set about to reclaim this land and start it again producing the crops that God intended it to grow.

We may also need your help in liberalizing your payments for small dams built even above our watershed structures. There are many such small creeks and tributaries that with a small dam could perhaps protect 40, 50, or more fertile acres.

This could be done while we were working to get the necessary people interested in the watershed program. This would spread the money out more so that more could be benefited. Perhaps if the Federal Government would pay 100 percent of the construction costs for these smaller structures, as you now do under Public Law 566, we could more quickly save more of our soil and water.

We know that barring a nuclear war that our population by 1975 will be such that our present water supplies will just not be sufficient. This does not take into consideration the very probable drought cycle that will probably swing our way such as we had a few years ago when 400 towns and cities—among them Oklahoma City—had to ration water to its citizens. Thus, we need to do a better job of providing industrial and municipal water supplies in Oklahoma and other States of the Union.

We feel that the Deep Fork Valley area, being in the very center of Oklahoma and thus the center of the Nation, will someday be the heart of America's industrial might.

We therefore encourage you gentlemen to do all that you can, and we are ready to cooperate with you in helping us protect and preserve these God-given assets.

We thank you again for allowing us to appear before you. We would like to present a more detailed viewpoint of our needs with your committee at a later date.

Thank you very much.

Senator HART. Thank you very much.

Are there any questions?

Mr. NELSON. Our next witness is Gene Cope, chairman of the Water Resources Committee, Southern Oklahoma Development Association.

Mr. Cope.

STATEMENT OF GENE COPE, CHAIRMAN, WATER RESOURCES COMMITTEE, SOUTHERN OKLAHOMA DEVELOPMENT ASSOCIATION

Mr. COPE. Distinguished Senators of the Senate Select Committee on Water Resources, before I begin my 5-minute thumbnail sketch of the situation in southern Oklahoma, I would like to ask permission to have the people to stand who are here from southern Oklahoma representing the Arbuckle project. It will take just a second.

Thank you, fellows.

The Southern Oklahoma Development Association is a group of people banded together in southern Oklahoma in six counties.

We are banded together for the purpose of developing any type of project that will help the economy and stabilize the economy of southern Oklahoma.

In our earlier talks, especially in water development, we concluded that our first development there for the first few years should be

centered on developing water for domestic use for that is our major need at this time.

That is one of the reasons that the Arbuckle project was started by this organization. Another reason is that the Arbuckle project was started by the Southern Oklahoma Development Association, and we intend to sponsor it through its conclusion, is that old Mother Nature has done more than her part toward placing in southern Oklahoma the most ideal geologically sound place for a dam and lake that has yet been surveyed by the Bureau of Reclamation in the State of Oklahoma.

That lake would be located in the foothills of the Arbuckle Mountains. The lake will cover 5,622 surface acres and will have 222,000 acre-feet of water in it. It will be capable of producing through critical periods about 25 million gallons of water per day. The pipelines from there will supply the cities of Ardmore, with a population of 30,000; the city of Wynnewood, a population of 3,500; Sulphur, population of 6,000; and Davis, population of 3,000; the large refinery at Wynnewood, the Ardmore and several communities which are located adjacent to the pipeline.

The watershed on the Arbuckle project is fairly small. It is in rolling hills, but it is almost entirely made up of limestone ranchland which is conducive to a very high type water to be used for municipal purposes. The project itself including pipelines will cost in the neighborhood of $13 million. About $2 million of that will be nonreimbursable, will have flood control value, fish and game and recreational facilities. About $10½ million of that will be reimbursed to the Federal Government over a period of 50 years for the sale of water to these cities involved.

Now, all of the fieldwork, the engineering has been completed on the Arbuckle project and is now in the final stages of feasibility. That report should be out sometime next month—in December.

So you gentlemen can expect in the early session of next year the Southern Oklahoma Development Association and the Oklahoma Reclamation Association and the national group will do all that we can to assist you in getting our project authorized.

I would like to say this in closing: In our section of Oklahoma we believe that the Government should not only assist in the engineering, in the construction of projects, but we believe that our Government should also help in the discovery, in the ferreting out of any type of project, whether it be soil conservation, Bureau of Reclamation, or the Corps of Engineers.

Thank you.

Senator HART. Thank you very much.

Mr. NELSON. Our next witness is Albert L. Connel, representing the Oklahoma Reclamation Association. He is the president of it.

STATEMENT OF ALBERT L. CONNEL, PRESIDENT, OKLAHOMA RECLAMATION ASSOCIATION

Mr. CONNEL. Gentlemen of the committee, before I enter into this discussion I would like all the people that are here from central and western Oklahoma that have reclamation projects under planning and are interested in projects that are under planning to please stand, if you please.

Senator HART. This confirms what the record already reflects, that there are widespread interests in Oklahoma.

Mr. CONNEL. Gentlemen, if you note in the back of my statement I have had a map [2] prepared to show you the area which I am discussing in my statement which comprises all of central and western Oklahoma.

We have in that two projects under construction and I believe three projects under planning that the feasibility reports are ready to be presented to Congress in the next session, and then a host of others.

I am going to be very brief orally with my statement. I shall not read my statement.

As I was introduced, I am president of the Oklahoma Reclamation Association. I am president of Washita Improvement Association, and I am also manager of the Fort Cobb Master Conservancy District, all of which are $1-a-year jobs and I do not collect the dollar.

I mention this, gentlemen, to emphasize that not only myself but my neighbors all over the western portion of Oklahoma are working to promote and develop water for their area and to my knowledge there is not one paid person in the group. It is a group of citizens in the several communities working for the future of their State and of their community.

And another thing that is very heartening about this, all of these communities which involve the large area are working together as though they were civic clubs existing within the bounds of one community. It is a people's project.

If I may digress just a moment, I am sorry Senator Kerr is out because——

Senator HART. The record should show that Senator Kerr was called to the phone.

Mr. CONNEL. Yes, sir. That is fine.

I want to thank you, first of all, as Members of the Senate for helping us on the Fort Cobb and Foss projects on the Washita Basin. Those are now under construction.

This may be a little irrelevant, but I think while you are out seeking information for water development you would like to know what is going on in the projects that are under construction.

Here he comes now and I am sure glad because I want him to hear this.

When the Washita project was authorized, the day the project was authorized, I went by the Commissioner's office, the Commissioner of Reclamation, and I said:

Mr. Commissioner, I have heard a lot of bickering and a lot of discussion about Government projects. Government projects can't get off the ground. They are expensive; they cost too much; they waste money.

I want to prove for once and all that that is not true. I would like to point out to you that the Foss and Cobb Creek projects in this instance are classified as model projects. Just last week the dam on the Fort Cobb project was completed and the cost of that dam, the engineers' contract, was $3,150,000 but the contractor even though he bid approximately $1 million under the engineers' estimate was able to build the project at $100,000 less than his bid.

On both dams, on the bid price on both dams, on Cobb Creek and Foss, we were able to save better than $2 million under the engineers' estimate.

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[2] Map retained in committee files.

Also, we are turning the clock back on time. I would like to mention this because this is a result, gentlemen, of Government and local people working together. I know Senator Kerr is very proud of that fact.

We would like very serious consideration given to flood control benefits and to recreation benefits. We think that in this case not enough was charged to flood control because here is another instance that I think even though it is a small figure so far as the national figure is concerned, I think you will be very proud of it. The dam was closed on the Fort Cobb project in April. It began to store water. Later, there came one of those floods that we frequently have out there and it was one of those terriffic ones, Senator Kerr.

I asked our county agent in Caddo County to make an estimate on the savings from flood control on that one incident. He said, "I am going to be very conservative because I don't want to be criticized."

After, he came up with his estimate. The savings on that one flood, according to his estimate, exceeded $1 million on savings on crops, of washing of land, and of destroying property and so forth.

We had another such flood in this interim development of that project. I thought perhaps since those projects are underway you would like to know about it.

Now, about the other projects that are under study and ready for authorization and construction, the western part of Oklahoma has plenty of water. It can be properly impounded to beneficial uses. But in the same period in 1952, 1953, we had floods that washed away our soil, washed away crops, took human lives, and did a lot of damage.

Then in the very same year, just a few months later, we had droughts in our particular community. We had bad droughts. We have pictures of them that I presented to the Congress in order to get this thing authorized, showing in our town, in our community, in other towns in the area, where the streams were dried up and there was a near water famine.

So that is a point that we want to make. We are losing population in western Oklahoma because of the lack of water. If we can develop our water we are going to sustain and regain our population losses.

We have a great source of wealth of resources in the soil that can be developed if we have water.

I know that Senator Kerr has a record on file of that in Don McBride's office.

The people are willing to pay their proportionate share of the costs of this to pay it back to the Government. They have already demonstrated that. We have several projects on record out there in the plains where the local communities have matched Government money in order to get their planning by.

This is a serious thing with western Oklahoma. It covers a large area. It covers a rich area and it covers an area that needs a tremendous amount of attention and the people of this area, central and western Oklahoma, are bound together under the banner of Oklahoma Reclamation Association and other organizations to do anything that they can.

And we certainly do appreciate this opportunity of appearing before you. We appreciate what the Senate has done for us. We ap-

preciate the fact that the Senate has carried the ball for us in Washington and we appreciate what the Oklahoma delegation has done, but some of these days—this might be off the record—we hope we can get some of our eastern Congressmen to understand our needs better.

Thank you very much for this opportunity.

The CHAIRMAN. Thank you, Albert.

(The prepared statement referred to follows:)

STATEMENT BY ALBERT L. CONNEL, PRESIDENT, OKLAHOMA RECLAMATION ASSOCIATION

Mr. Chairman and gentlemen of the committee, it is a pleasure to appear before you in behalf of the Oklahoma Reclamation Association in the interest and needs of or for water development and conservtion for Oklahoma. The Oklahoma Reclamation Association is an organization of Oklahoma citizens composed of people from most every walk of life—farmers, ranchers, business and professional men and others. The purpose of the organization is to pursue an orderly plan of development for the coordinated uses of all of the water in Oklahoma for the people of this State. The Oklahoma Reclamation Association appreciates the farsightedness of the U.S. Senate in appointing a select committee to study and compile information of all the water needs for our great country's future. Since your committee is having each of the Federal agencies engaged in water-resources activities, prepare a report covering expected developments in its primary fields of responsibility, I shall make no attempt to spell out specific projects, but will confine my remarks in a general way to the problem of a better plan of development for Oklahoma's waters.

The western two-thirds of Oklahoma experiences severe droughts and floods frequently. In many localities within a period of the same year, floods of tremendous proportions damage great areas, destroying property, crops, and even human lives, washing away precious soil, and then within a very few months in the same area extreme droughts have been experienced. Again with crops burning up, stock starving for water, and even people being on the brink of water famines, experienced engineers have been telling us for many years that enough water traverses these areas each year to adequately take care of all of the local needs, if the water could be properly developed and impounded.

There lies in the soils of the western two-thirds of Oklahoma large amounts of natural resources that can be developed when sufficient water supplies are available. If the western part of our great State is to continue to prosper, I am convinced that something must be done, and it should be done immediately to begin an orderly development and conservation of water, and to prevent the waste of water. We believe that the use of water must be so used to do the greatest good for the greatest number of people. The laws of our State have priority of use, and I want to emphasize that in areas of limited supply, as in western Oklahoma, careful planning and development and administration of the vital resource is very important because it is our most important, vital, and precious product.

The Oklahoma Reclamation Association believes that there should be a better understanding and working agreement between all of the Federal agencies interested in water conservation and development; that there should be less overlapping of responsibility; that there should be less duplication in the planning and engineering field; that there should be a greater cooperative effort among these agencies to expedite development and conservation of the taxpayer's money. The acuteness of our water supply in western and central Oklahoma is borne out by several facts, and perhaps one of the most outstanding is the fact that Oklahoma City, in its quest for an adequate water supply to meet its needs in the very near future, has constructed Atoka Dam and Reservoir in southeast Oklahoma and plans for further expansion. The citizens of western Oklahoma, under the banner of the Oklahoma Reclamation Association, are awake and ready to cooperate with all who are interested in an orderly development of Oklahoma's water resources. This association is composed of many towns and farming areas which are working harmoniously together as though they were civic clubs existing within the boundaries of one community. At the present time there are under construction and planning several Bureau of Reclamation projects under the sponsorship and prime interest of the Oklahoma Reclamation Association. Under construction are the Foss Dam on the Washita River west

of Clinton, Okla.; the Fort Cobb Dam on Cobb Creek, a tributary of the Washita River, northwest of Anadarko, Okla. Under planning there is a project at Woodward, Okla., an irrigation project at Canton, one at Enid, one at Watonga, one at Mangum, and one at Waurika; Ringold Dam, at the boundary of Texas and Oklahoma; Arbuckle Dam, at Sulphur; Liberty Bottoms Dam, at Red River; Norman Dam, on Little River; Corbin of Kansas and irrigation canal east of Eufaula. Of the above mentioned, feasibility reports are ready on three of them.

All of these proposed projects have a definite need in their particular community. Much money, as well as many hours of work have been spent by local citizens to see their particular project pushed forward, ready for authorization. Most of them carry an emergency need for domestic water, as well as the benefits that accrue from irrigation flood control and recreation. It is of great importance to the people in those communities that they receive immediately the very best of attention and assistance. The people of central and western Oklahoma have already demonstrated by their interest that they are willing to repay to the U.S. Government the reimbursable portion of these projects. The Oklahoma Reclamation Association, however, does feel that a greater consideration should be given in future reclamation projects, to larger nonreimbursable allocations to fish and wildlife and to recreation. Some of our most recent experiences in interim benefits of development in projects under construction have proven that flood control is effecting more benefits than was originally estimated and that this allocation of project costs may be low. Recent surveys show that the growing demands on recreation creates indirect income to the Government that is insurmountable.

We in central and western Oklahoma want to see our water facilities developed with maximum benefits in the shortest practicable time. We are willing and anxious to pay our share of reimbursable costs. We wish to preserve the economy that now exists in the central and western part of our State. We want to see our natural resources developed. We want our part of the State to remain for the future generations as a good place to live, a place for our people to raise their children. We are a part of America. We ask assistance from the Federal Government to help us expedite our water needs, so that it will not be too late.

Cordially yours,

ALBERT L. CONNEL,
President, Oklahoma Reclamation Association.

Mr. NELSON. We have one more witness.

Hershel, can you give us yours in about 2 minutes?

Hershel Burrus, executive director of the State conservation board. Let us move with dispatch.

STATEMENT OF HERSHEL BURRUS, DIRECTOR, STATE SOIL CONSERVATION BOARD

Mr. BURRUS. Mr. Chairman and members of the committee, it is indeed an honor to be able to appear before you today for the farm people of Oklahoma in the interest of utilizing and conserving our soil and water. Every citizen of this great land should be grateful to the committee for taking of your time to go around over these United States collecting information that would help you in making that great and vital decision as to the development of our natural resources, particularly water.

We are all well aware of the fact that the great frontiers of the West are gone. The fact that is coming home to us more slowly is that we must live and exist where we are now—there are no other frontiers to conquer; and, as the density of our population increases, we can see over the horizon, problems not heretofore confronted: Problems such as conserving the soil which was once so plentiful; problems of keeping it upon the hillside where it can produce; problems of needed water irrigation; problems of water for small cities

and towns; water for the larger communities that must have an adequate supply, if industry is to continue to expand to meet the ever-growing population needs.

The farmers of Oklahoma are satisfied with the small watershed approach to the conservation of our soil and water. We believe that this program can adequately meet the needs for needed water that agriculture must have. The competition for the tax dollar is keen. You gentlemen of this committee must make the decision of how much money will go to the space missiles, to our defense, to our public roads, our public schools, our welfare program—all of these are vital. No one program can be sacrificed for the benefit of another program; but we do appreciate your consideration of the water resources and their importance to our national economy.

The program of protecting the small creek bottoms and trying to hold each drop of water where it falls is sound in its approach in trying to meet the needs of agriculture's water. It has proven that it will work. In some instances, as much as $7 worth of protection has been obtained for each dollar spent of construction funds and these benefits assessed only as agricultural benefits.

The needs of small towns and villages for water are being met by this program. As an example, the city of Duncan, Okla., was able to obtain a 3-year supply of water by cooperating in this program at a cost of 1¾ cents per thousand gallons.

This can and will be multiplied many, many times on the small watersheds of this State. It is hoped and believed that the small watershed program would complement the downstream works of improvement by retarding the silt load of the main stem by furnishing a more normal flow and a control flow of the water into the larger reservoirs.

Let us not get embroiled in a controversy as to whether the development of our water should be the upstream or the downstream phase of development, rather, let us appraise the benefits that each can offer our great society so that any development will be in the best interest of the people who pay the bill in taxes and will benefit from the works of improvement. I repeat, the farmers and ranchers of Oklahoma are satisfied with the small watershed approach to their water problems.

Of the 72 applications made under Public Law 566, 7 watersheds have been planned and are under construction at this time. Three others are planned and ready for money to be appropriated by the Congress for construction. We are proud of the fact that we were in a position to use more than our share of the money appropriated for the small watershed program by the last Congress. Our own State legislature appropriated enough money for four additional planning parties to speed up the work of planning the small watersheds in our State.

We humbly request that consideration be given toward speeding up both the planning and the construction phase of the small watershed program throughout the Nation.

Thank you.

The CHAIRMAN. Thank you, Mr. Burrus, for your very timely remarks on one of the greatest phases of water conservation.

The people of Oklahoma are deeply conscious that a cornerstone of water conservation is in connection with our soil conservation efforts on the upstream project, and the program is the one which is so near to your heart and you made a great contribution to it.

Under the law passed in 1956, amended in 1958, we have been able to secure increasing appropriations both for the Nation and for Oklahoma. In fact, no State in the Nation is ahead of Oklahoma in that program, and it is because of the great work which people which you represent have done and because of the complete dedication of your delegation in Congress to the most rapid development possible of that program.

I appreciate what you said very much.

Mr. BURRUS. Senator, we appreciate our delegation, sir, too. Thank you, sir.

Mr. NELSON. Our next coordinator is Morrison Cunningham, superintendent and engineer of the Oklahoma City Water Department, Oklahoma City.

STATEMENT OF MORRISON B. CUNNINGHAM, SUPERINTENDENT AND ENGINEER, OKLAHOMA CITY WATER DEPARTMENT, OKLAHOMA CITY, OKLA.

Mr. CUNNINGHAM. Senator Kerr and distinguished gentlemen of the committee, it is a real privilege to be here today and to participate in this hearing.

The subject deals largely with municipal water and like other water users in a great many instances, the cheaper supplies have already been developed and we are now having to develop expensive supplemental supplies, like Oklahoma City is doing at this time, where we are going to southeast Oklahoma.

With the permission of the committee I would like to file my report and then mention a paragraph or two and call on the panel.

The CHAIRMAN. That is fine.

(The statement referred to follows:)

STATEMENT OF MORRISON B. CUNNINGHAM, SUPERINTENDENT AND ENGINEER, OKLAHOMA CITY WATER DEPARTMENT, OKLAHOMA CITY, OKLA.

Mr. Chairman, and gentlemen of the committee, on behalf of the city of Oklahoma City we appreciate the opportunity to make this statement before your committee.

The city of Oklahoma City has a population estimated to be 316,000, largely served by the city water department, with water obtained from the North Canadian River. The water consumption has increased approximately 50 percent in the past 10 years. Our comprehensive long-range water study, which was completed in 1954, estimates that the total water needs will double by 1975. We now feel this estimate will be low since it is based on estimated population of 400,000 by 1975, and it now seems reasonably certain we will greatly exceed this. It might be of interest to note that in 1940 our capita use of water was 64 gallons per day per capita. At the present time our per capita use of water is 112 gallons per day, and we have estimated our future requirements by 1975 to be 180 gallons per day per capita, and by the year 2000, 225 gallons of water per day per capita. These estimates may be too conservative.

Our future water supply is being developed in southeast Oklahoma, which will supplement the water we get from the North Canadian River. The distance is 100 miles to the first reservoir, which has been completed and now filling with water. Detailed study of the facilities to bring the water to Oklahoma City is now being made. Within 10 years we will plan to construct an additional reser-

voir in southeast Oklahoma, and look forward to contracting for conservation storage in some of the proposed Federal reservoirs in southeast Oklahoma, in accordance with the Water Supply Act of 1958. We think the Water Supply Act was a wise action to take, since we feel that it is most beneficial to include conservation storage in the Federal reservoirs, for present and future use.

We should like to briefly comment on some of the topics suggested in the outline of the committee for discussion today.

We heartily approve continuation of the Federal Government taking the lead in the development of our water resources. To supplement this program, we think we should continue to give support in the new technical methods and research. This program must be accelerated if we are to find ways and means to purify some of the industrial wastes, in order to protect the water in our streams for reuse. One of the most helpful programs is Public Law No. 660, which deals with water pollution control. We recommend the continued support of Congress. One of the effective parts of this work deals with the collecting of basic data and investigations of origin of pollution of both natural and manmade. A good example of this work now going on in connection with the AWR, is the studies on the Arkansas and Red Rivers. This work should continue to be financed since it will indicate what can be done to improve the water quality in our streams.

In connection with research from industrial waste pollution control, we believe we would find that there is not enough work being done to even keep up with this complex problem. Some waste presents a problem because—first, we do not know exactly what it is, and second, treatment must be perfected. Therefore, we would suggest that this work have continued financial support under Public Law No. 660. We have a small application of research now going on at our sewage treatment plant, which is financed by the city of Oklahoma City and the Oklahoma Gas & Electric Co., where detergents cause foaming, where the sewage effluent is used for industrial cooling water. It now appears that we are approaching a solution.

Another research project which we heartily endorse is the evaporation reduction now being carried on by the Department of Interior, Bureau of Reclamation, under the authorization of Congress. Two projects have been carried out on Lake Hefner here at Oklahoma City. The results have been published jointly by the Bureau and the city of Oklahoma City. The results are very encouraging. Continuation of this work will, in our opinion, make a great contribution on water saved by evaporation reduction.

Another project which we heartily endorse is the present support Congress is giving to the saline water conversion. The success of this program to bring the cost within a reasonable price would be one of the great contributions to the welfare of man. In central Oklahoma we have three great rivers. These three rivers are parallel for 100 miles. The North Canadian River, in the center, has a good quality of water. The Cimarron River, to the north 15 miles, is very salty, more so than the ocean waters. The South Canadian River, to the south 10 miles, has more than twice the average annual flow than that of the North Canadian River, but has more chlorides than is recommended for drinking water, and would be very corrosive as far as municipal water is concerned. Practically no use is being made of this water because of the high chloride content, and the success of the saline water conversion program will certainly make a great contribution to many areas in the United States and over the world by finding an economical way to reduce chlorides in water.

We should also like to state that we have had two contracts on weather modification, and we have also followed and used long-range weather forecasting obtained from private industry, supplementing the valuable information we get from the U.S. Weather Bureau. We feel that there must be highly skilled, experienced meteorologists and other scientists to carry on this work successfully. An analysis of our contracts show that we have received great benefit during the droughts, and even greater benefits could be obtained by research.

We urge that you also consider Federal support research in connection with weather modification and long-range weather forecasting. In our opinion, at least a portion of the funds allocated by Congress should be channeled to the private industries, having competent technical organizations, who have already demonstrated successful application of the principles of weather modification and long-range weather forecasting.

OKLAHOMA CITY, OKLA., *December 1, 1959.*

HON. ROBERT S. KERR,
Chairman, U.S. Senate Select Committee on National Water Resources,
New Senate Office Building, Washington, D.C.

DEAR SENATOR KERR: The testimony presented before the public hearing of your committee in Oklahoma City on Monday, November 30, did not include a statement pertaining to one of our most important projects, namely, extension of the Oklahoma City floodway project. We would appreciate very much if we could have this statement made a part of the record.

An extension of the Oklahoma City floodway project is highly desirable, in our opinion. We believe the ratio of benefits will exceed the requirements of the Flood Control Act. This is particularly true since the Western Electric Co. is building one of their large plants, which will employ about 4,000 people, within a few months after they open the plant for operation during 1960. In addition, there are also a great many industries and warehouses locating in this area to be protected from floods by the extension of the Oklahoma City floodway project. This would extend the project from Portland Avenue to Lake Overholser Dam. We would also like to have consideration given to the area extending from Lake Overholser to the vicinity of Yukon, Okla.

The city of Oklahoma City will have representatives to present detailed supporting data before the public hearing, which we understand will be scheduled within the next few weeks by the Corps of Engineers, Tulsa district.

Very truly yours,

MORRISON B. CUNNINGHAM,
Superintendent and Engineer, Oklahoma City Water Department.

The CHAIRMAN. I notice in your statement you have some figures with reference to the per capita consumption. I take it that is domestic consumption?

Mr. CUNNINGHAM. That is domestic consumption and that is the net use of water.

The CHAIRMAN. In Oklahoma City?

Mr. CUNNINGHAM. Yes, sir.

The CHAIRMAN. That is the per capita consumption for domestic purposes?

Mr. CUNNINGHAM. Yes.

The CHAIRMAN. All right.

Mr. CUNNINGHAM. When we were putting on the bond issue in 1940 for Lake Hefner, the per capita use was 64 gallons per day. That has increased to 112 gallons a day now and expected to be 185 gallons per day in the year 1975 and 225 gallons per day in the year 2000 which I believe the estimated figures are too conservative.

Just to mention some of these paragraphs, I want to say we think that Public Law 660 is a very fine vehicle to do a lot of work in connection with cleaning up some of our streams and certainly pollution that exists in many places.

We feel that treating sewage, particularly industrial wastes, is a complex problem. Like Dr. Peach brought out this morning, this complex problem must receive a lot of research in order to find the solution so that we can even know how to treat sewage effluent. We must also take advantage of Public Law 660 in doing what we can to find the ways and means to reuse sewage effluent. We are doing some work on this subject now here in Oklahoma City with a project in cooperation with the Oklahoma Gas & Electric Co. in which we are trying to reduce the new effluent from detergents that get into the water so that the water can be used for cooling purposes for industry without foaming.

It looks like we really have a good project there and it looks very much like it is going to prove very successful. Another project that

I would like to mention and solicit your support, and that is the continuation of the evaporation-reduction study and we had the good fortune of Lake Hefner being selected as the big experiment 2 years ago. The biological work was started and Lake Hefner then came in last year and that work looks very good.

Mr. Barclay is here today and he has some copies of the comprehensive report. I would like to ask Mr. Barclay who is district manager of the Bureau of Reclamation, and who has been wonderful in giving us cooperation, to come up and file with the committee the comprehensive report. I am sure you are glad to have it.

The CHAIRMAN. That is the comprehensive report on the results of that experiment.

Mr. CUNNINGHAM. Yes, sir.

The CHAIRMAN. We are mighty happy to have that. That is the first lake of that size, 2,500 acres. Thank you very much, Mr. Barclay. We will file this with the report.

Is there an abbreviated report that could be put in this record with appropriate references to this document?

Mr. BARCLAY. I can get copies of it.

The CHAIRMAN. Very good.

If you would do that we would greatly appreciate it, sir.

Mr. BARCLAY. I will file the rest with you.

(The report referred to above follows:)

SUMMARY PREPARED BY BUREAU OF RECLAMATION

REPORT BY THE COLLABORATORS—WATER LOSS INVESTIGATIONS: LAKE HEFNER 1958 EVAPORATION REDUCTION INVESTIGATIONS, JUNE 1959

Working in cooperation with engineers and scientists of other governmental agencies, Bureau of Reclamation research scientists have demonstrated that techniques are available to reduce evaporation from large reservoirs by placement of a film-forming chemical on the water surfaces. This is the conclusion reached by the committee of collaborators from Federal, State, and municipal agencies who, during the period of July 7 to October 1, 1958, performed at Lake Hefner, Oklahoma City, Okla., one of the most comprehensive experiments ever undertaken in the field of reservoir evaporation.

The chemical film the researchers at Lake Hefner had under study was composed of the compound hexadecanol, also known as cetyl alcohol. When hexadecanol is spread on a water surface, it forms a film or monomolecular layer—an invisible shield between the water and the surrounding air, 1 molecule or about 6 ten-millionths of an inch thick. The layer forms because the molecules aline side by side, the hydrophilic, or water loving, end in the water and the hydrophobic, or water fearing, end in the air. The alinement is similar to paper matches in a matchbook and forms an invisible and pliable layer on the water surface, which prevents escape of water molecules to the surrounding air.

The study of the phenomenon of the monomolecular layer has been underway in laboratory investigations for more than 30 years. But the question of the method of application to a large body of water and the host of accompanying questions, including the important effect of the layer on aquatic wildlife and on humans, required the concerted effort of scientific teamwork for resolution at a suitable reservoir of sufficient area.

The chairman of the committee of collaborators was Grant Bloodgood, assistant commissioner and chief engineer of the Bureau of Reclamation. Members of the committee included representatives from the city of Oklahoma City; Oklahoma State Department of Health; Public Health Service, Department of Health, Education, and Welfare; Weather Bureau, Department of Commerce; and the Geological Survey and the Bureau of Reclamation of the Department of the Interior.

Many reservoirs were considered for the large-scale field tests. However, Lake Hefner, a municipal water supply reservoir about 2,500 acres in area and

a part of the water supply system for Oklahoma City, was chosen because of several factors, including the size of the lake, geographic location, and meteorologic conditions existing there during the summer and early fall months. Most significantly, the fact that a detailed water budget (accurate data on the inflow and outflow of water), including data on evaporation losses which had been earlier determined by several cooperating organizations, demonstrated the feasibility of conducting the accurate evaporation studies at the lake.

In June 1959, a final report by the committee of collaborators was issued giving the results of each phase of the study. The following is the joint statement of the committee included in the final report:

"It has been demonstrated by the Bureau of Reclamation that techniques are available to cover the 2,500-acre Lake Hefner with a fully compressed layer of hexadecanol, given favorable conditions. The Geological Survey obtained the data needed to evaluate the success of the film in suppressing evaporation. Techniques developed as the result of research in recent years were used to measure the actual evaporation and to compute the evaporation that would have occurred if no film had been applied. The Geological Survey's evaluation showed that during the period of treatment, July 7 to October 1, 1958, it was possible to achieve an overall reduction in evaporation of slightly more than 9 percent, although weather conditions were not favorable for maintaining the film.

"It has been demonstrated that the effectiveness of evaporation retardants is lessened at higher temperatures, and the 9-percent reduction achieved is about one-fourth of the potential reduction with the kind of material used at Lake Hefner and at the water temperatures experienced. The water savings by evaporation reduction at Lake Hefner were accomplished at a total cost for labor and hexadecanol approximately equal to the total value of the untreated water saved to Oklahoma City.

"No hexadecanol could be detected by the Public Health Service in water reaching the inlet of the Oklahoma City water supply. Oklahoma City officials found that concentrations of micro-organisms normally present in lake waters increased markedly as a result of feeding on the hexadecanol. However, the purified water met Public Health Service drinking-water standards.

"The wind has a very pronounced effect on the behavior of the film. With wind velocities greater than about 20 miles per hour, it was found impractical to maintain a film on Lake Hefner.

"It may be expected that under an operational program with improved procedures and materials, the cost of evaporation reduction would be considerably less than experienced in the Lake Hefner trial."

The method chosen by Bureau of Reclamation scientists for applying the monolayer-forming compound to Lake Hefner was one in which a dry powder was mechanically suspended in water and sprayed onto the surface of the lake. Two separate identical suspending units were used in this operation; one unit was mounted in a 17-foot boat, and the other was mounted on a floating platform supported by four pontoons. The platform was propelled by a 25-horsepower outboard motor in normal operation; however, another 25-horsepower motor was mounted on the platform for emergency operation. The platform permitted easy access to the mixing equipment and permitted carrying loads of more than 1,000 pounds of the powdered materials. As much as 400 pounds of cetyl alcohol could be carried in the boat at a time, and this was adequate, as this was about one-half a day's supply for the lake.

The mixing and dispensing equipment consisted of two mixing units powered by a single engine through a pully and clutch arrangement, which permitted the mixers to be run individually or simultaneously. The mixing chambers were made from 55-gallon oil drums. A single engine was used to power the intake and discharge pumps. With this equipment, water was pumped from the lake into the mixing chamber, where is was mixed with dry powdered alcohol introduced by hand scoops at the desired rate. Three mixing propellers quickly mixed the water and powder into a smooth uniform suspension, which then flowed into the discharge pump and was forced through a spray system onto the lake surface.

Applications, weather and other conditions permitting, were made during the daylight hours, 7 days a week. Often, crews started as early as 5 a.m. and worked as late as 6 p.m. Later in the summer, an effort was made to have the greatest film coverage coincide with the time of highest evaporation. During the summer, a total of 40,040 pounds of cetyl alcohol was applied to the lake.

For the 86 days of the application phase of the test, treatments were made for 55 days. Applications were not made for the remaining 31 days because of high winds, rain, high humidity, and maintenance and repair of equipment. The maximum coverage attained at any one time was 89 percent. Coverages exceeding 90 percent were not expected because of the many small shallow coves and bays along the parts of the lake shoreline. The maximum evaporation savings for any computation period of about 2 weeks was 14 percent, as compared to a possible maximum savings under prevailing water temperatures of about 35 percent.

Accounting of costs was an important factor in the evaluation of the results. Meticulous records were maintained on costs of hexadecanol applied, gasoline, oil and repairs for operations of boats, salaries and wages of operators and laborers, motor vehicle operation, rental of barge, equipment depreciation, and miscellaneous expenses.

The cost per acre-foot of water saved ranged from about $58 to $86, with an average for the entire period July 7 to October 1 of $61.21. This compares with a value of raw water in Lake Hefner of about $60 per acre-foot, as reported by the city of Oklahoma City.

The costs of hexadecanol were 73.5 percent of the total costs, and therefore any significant reduction of material costs will have an important effect on the reduction of overall costs of the future operations. Based on discussions with manufacturer's representatives, it is anticipated that material costs may be reduced as much as 50 percent of present cost.

What about the effect of hexadecanol on water quality for human consumption? In his review of the Lake Hefner results, Mr. Grady F. Mathews of the Department of Health, State of Oklahoma tersely summarized these important conclusions:

"A review of the study data of Lake Hefner investigations resulted in the following observations on the public health aspects of the evaporation reduction work:

"1. There were no apparent toxic effects resulting from the application of hexadecanol.

"2. There were no undesirable effects on the treatment processes of the lake water.

"3. There was no interference with the normal recreational uses of the lake.

"4. There was a large increase in the bacterial content of the lake water during the period of hexadecanol treatment, which after careful consideration, was deemed not to be significant.

"These observations support the conclusion of this department that no deleterious effects resulted from the addition of hexadecanol to the Lake Hefner water supply."

The 1958 Lake Hefner evaporation reduction investigations have shown that much has been learned about the possibilities, techniques, and methods of analysis of monomolecular layers. This information will be valuable in the ultimate development of practical methods of reduction of evaporation losses from large reservoirs. However, much work remains to be done before the full operational potentialities of this techniques of evaporation reduction reaches a stage of development where specific recommendations can be made for selected reservoirs with established limits or practically attainable effectiveness based upon firm cost-benefit ratio economic data.

Mr. CUNNINGHAM. The only other thing I wish to say is that we also solicit your continued support in weather modification, long-range weather forecasting. We think that is certainly a part of our water program and we have had two contracts on that.

We feel it has been quite successful.

We have used weather forecasting to supplement the wonderful work that is given us by the Weather Bureau that has been most helpful. I will stop right there and save time unless you have some questions.

The CHAIRMAN. Your entire statement will be inserted in the record.

Mr. CUNNINGHAM. Thank you, sir.

Senator CASE. Mr. Chairman, I would simply like to state that I particularly appreciate the endorsement you have given to the saline water conversion program and the studies of weather modification, in view of the fact that I have had personal interest in both pieces of legislation and the extensive program on the saline water conversion.

Senator Anderson would have been here for this hearing had he not taken sick. Senator Anderson and I sponsored the law which was passed in the last Congress which authorized some demonstration plans for desalinization of water.

The location of one of these plants for converting saline water has already been established. The location of the plant to convert brackish water will be determined shortly. That program is moving along. We are glad to know you are interested in it.

Mr. CUNNINGHAM. Yes, sir. We were disappointed that we were not selected as one of the stations. However, that does not lessen our interest, and we will certainly give it all the support we have because we feel that program is wonderful.

As stated in the report, we have a river containing chlorides and it is too salty to use. But the success of that program will help a lot.

Before we start I want to say our time has been reduced from an hour to about 18 minutes, so that leaves us about 2 minutes on the average for each speaker.

So any of you that would prefer to file your report rather than to take up more than 2 minutes feel free to do so.

Our first speaker is L. L. Males, president, Upper Washita Soil Conservation District, representing the Elk City Chamber of Commerce. Mr. Males.

The CHAIRMAN. I would like to tell this committee that here is one of the most successful advocates of upstream flood control and water conservation in the United States.

Red, we are glad to have you.

STATEMENT OF L. L. MALES, PRESIDENT, UPPER WASHITA SOIL CONSERVATION DISTRICT, REPRESENTING THE ELK CITY CHAMBER OF COMMERCE

Mr. MALES. Thank you, Senator Kerr.

I represent the Elk City Chamber of Commerce, but my particular interest and the chamber of commerce's is in the watershed program. This is because of the wonderful opportunities it has for the development of municipal water supply and also, because of what wonderful benefits the trade territory gets from it which directly affects our businessmen members of the chamber of commerce.

We live in a low rainfall area but even there we do think there is a lack of water. We think that we have water sometimes, often times all over the place, but for the lack of management it destroys everything we have done instead of helping us.

We further believe that there is enough water even in western Oklahoma for all of the needs we have for water today and in the foreseeable future if we are wise enough to develop, conserve, manage, and share it.

The sharing part is not easy.

Furthermore, we believe that the solution to our water problems in Oklahoma begins out on the land where the raindrop first strikes

the soil. Breaking up that raindrop, getting it into the soil to raise the water table to cause the streams to flow again, trapping runoff to the point where it falls it is possible to prevent flooding and then use that rainwater over and over again as it goes down the stream.

We have learned that a drop of water increases in value according to the highest point at which it is delayed on the watershed.

Soil and water problems are almost identical in Oklahoma, and you cannot treat one without the other, but fortunately they both respond to the same treatment.

The land treatment measures such as terraces, contours, covercrops, diversions, farm ponds, all of those things conserve soil as well as water.

During the past 5 years near Elk City, Okla., the first project on the Washita was completed; during the 5-year drought from 1952 to 1956, we saw the watershed program and the land-treatment measures help alleviate the suffering from this drought, of course, not by making it rain more but are getting more benefit from water that did fall.

We saw the water level in the flood plain of the creeks treated with the watershed program rise and now that the streams flow we have seen farmers pick up water for irrigation to grow feed for the livestock and to stabilize the livestock economy of this community.

During this same time we have seen a third, in some instances, of the bottom land of the creeks that were formerly destroyed for use because of frequent flooding reclaimed to the people who own it, the people who have paid taxes on it for all these years.

We have seen recreation that we never had before, camping, boating, fishing, water-skiing, all of which is new to us in western Oklahoma.

We have seen new homes built out on these watersheds, new ranch and farm homes. We have seen young people decide to stay on the land for a change.

During the floodtimes we have seen the bountiful crops harvested off of this bottom land where the homes, the livestock, the roads, and the bridges were saved from destruction. While on the untreated creeks we have seen all this stuff sweep away.

Last month, in Stillwater, for instance, enough damage was done, I believe, to have treated those two creeks for flood prevention. They are still not treated.

This may happen over and over again. They are only two but there are many more instances in Oklahoma where this is true.

In fact, 70 percent or thereabout of all the flood damage that happens in Oklahoma, happens to creeks where oftentimes nobody knows about it.

When you gentlemen appropriated money for this Public Law 566 program, the first few times in fact it seemed it was moving very slowly. Part of that is because it is not a Government program. The initiative must come from the local people. It is a new concept and people have a habit of toothing the horse before they buy it.

But here in Oklahoma, Senator, the toothing period is over. Oklahoma is stepping out ahead of the Federal Government in this program as evidenced by the fact that you heard today. There are 72 applications for Public Law 566 and that is in addition to the 5 mil-

lion acres on the Washita where people are clamoring for speed. Speed up this program.

In the past this delay, I will admit, was on our shoulders but in the future it is squarely on the doorstep of the administration and the Congress as to how fast we go.

We need more money. We need increasingly more money each year for several years because we never had enough to operate after people became aware of the program.

Now this exploding population we have been hearing so much about must have water. That is why you are here today. But they also must have some food to wash down with that water and fiber to wear.

We have people in this country who say, "Why worry? We have a surplus of farm commodities." Sure. We have a huge 6 to 8 percent overall farm surplus, but because there is a screw loose somewhere it is causing us embarrassment.

To read Life and the Post and most of the metropolitan newspapers you would think the farmers ought to duck their heads in shame because they have been able to produce so well. How silly can we get?

There are a lot of things worse than a surplus of food.

And our real trouble, gentlemen, in this country is going to come when we cannot produce a surplus of food, and it can happen here.

There are a million acres of our best land going under concrete each year besides hundreds of thousands of acres we are letting become ruined because of bad management, neglect, and so forth.

We know that of the $87 billion budget we are laboring under, most of that goes for defense and we are for defense, but the preservation of our soil and water resources is just as much national defense as the guns, planes, missiles, and moonshots, perhaps more so, because if we become a have-not we won't have to fight them off; they won't want us.

The watershed program returns many times over what it costs and we hardly feel that a $37 million appropriation out of $87 million budget is a fair split for a program to keep this America the beautiful, the bountiful, and the strong.

Thank you.

Mr. CUNNINGHAM. Thank you.

I understand Gerald Wilkins is unable to be here.

In his place, David Fudge, executive director of the Oklahoma Municipal League, will present the statement.

STATEMENT OF DAVID FUDGE, EXECUTIVE DIRECTOR, OKLAHOMA MUNICIPAL LEAGUE, REPRESENTING GERALD D. WILKINS, OF ENID, OKLA.

Mr. FUDGE. Mr. Chairman and gentlemen of the committee, due to the time element I will present a very brief statement and ask permission to submit details later.

My name is David Fudge. I am the executive director of the Oklahoma Municipal League, which has a membership of 180 incorporated municipalities in all areas of the State. I appear here today due to the unavoidable absence of our president, Mr. Gerald D. Wilkins.

We wish to express our very sincere appreciation for the opportunity to appear before this most distinguished committee. We Oklaho-

mans are honored by the fact that its chairman is our own senior Senator.

This committee is engaged in a study of one of the most vital and important national problems of our time. Unless we can put to beneficial use all our national water resources, the future of our country is dim, indeed.

As to Oklahoma's municipal water problem, it is basically one of making available our whole source of supply. On the eastern side of the State we have adequate resources for multiple-purpose reservoirs and all the economic development which can go with them. In western Oklahoma we must depend largely upon ground water whose sources and rates of replenishment are not yet fully known. In other words, our problem in the one area is utilization and in the other more knowledge.

As of today, we believe it is safe to say that not a single Oklahoma municipality has a water supply adequate to its future. Their needs by 1980 will depend: first, upon the rate of development of plans and construction of facilities, and secondly, upon the rate and kind of industrialization which will use our water.

Based upon a straight-line projection of municipal water consumption in Oklahoma between 1950 and 1955, the need in 1980 will be for 170 gallons per capita per day. Conservative engineering estimates are that there will be some curvature of the projection, and that 1980 consumption will be about 180–200 gallons per capita per day. If our future industry is to use municipal water in any considerable quantities, this figure must be greatly increased. Nationally, industrial water consumption is about seven times municipal requirements.

The people of Oklahoma are fortunate in that they amended their State constitution in 1957 so as to authorize the State and its local subdivisions to enter into joint water agreements of almost any kind with the Federal Government and with each other, so long as they are economically sound. We know, however, that our municipalities alone cannot finance the tremendous outlay for supply facilities necessary to be built between now and 1980. We can pay our share through reservoir space leasing or direct water charges on long-term, or life-of-the-project contracts.

In summary, we must learn the water potentials of our western areas in order to plan intelligently, and at the same time, we must carry on the eastern Oklahoma developments as rapidly as possible and as far to the west as possible. Pollution abatement and salinity control also are tremendously important factors in our overall problem.

We have come a long way in this State. We have a long way yet to go. With all the information this committee will gather here and throughout the country, we believe it and the Congress can determine all the facts necessary to properly use and conserve our most precious natural resource.

Thank you.

The CHAIRMAN. Thank you, David.

Mr. CUNNINGHAM. Our next speaker, Frank Ogden, State representative from Texas County is unable to be here and I understand that Harold Wood, manager of the Chamber of Commerce of Guymon, will speak at this time.

Will you summarize it?

STATEMENT OF HAROLD WOOD, REPRESENTING FRANK OGDEN, STATE REPRESENTATIVE OF TEXAS COUNTY, REPRESENTING THE GUYMON CHAMBER OF COMMERCE

Mr. WOOD. Yes, sir; we surely will.

Mr. Chairman, members of the committee.

They have asked us for a brief summary on the statement that we are submitting here today which I will be most happy to do.

Out in the Panhandle counties of Oklahoma we have a project under study at the present time. The Corps of Engineers is giving it a restudy. It is called the Optima project. It was originally authorized in the Flood Control Act of 1936. At the time it was found to be not quite feasible so this year, 1959, they have allocated funds for restudy.

Colonel Penny of the Corps of Engineers has indicated that that study should be completed by mid-December, sometime during the month of December.

In the study the Bureau of Reclamation has informed us that we cannot use irrigation in our area as part of the feasibility study because all irrigation waters have been previously committed to the Canton Reservoir and will be needed there. We may have to depend upon recreation to bring this dam into the realm of feasibility. If so, it can very possibly come to Congress for action.

We are going to ask your support in giving this dam your consideration as a flood control project in our area.

If you will notice on the map on exhibit A in our summary it is the only project under consideration in this area in the three panhandle counties.

The CHAIRMAN. In order that the committee may have a better idea about it, would you give us the length of the Oklahoma Panhandle, east and west.

Mr. WOOD. Well, let us say I would say that it is probably going to run about 220 some miles across the entire length of the panhandle, about 220 some miles, Senator.

The CHAIRMAN. And this is the only such project which has been developed or sought or worked for in that entire area.

Mr. WOOD. That is correct.

The CHAIRMAN. I am glad to have that in the record for the reason that people in many areas of the country cannot contemplate a productive area of such wide scope, when they understand you to be talking about just three counties.

Mr. WOOD. Yes, sir, thank you. I appreciate those remarks.

On the next map, gentlemen, you will notice we have a tremendous ground water supply in our area. At this point the State water resources board has been conducting a limited survey. We would like to know really what the limits of this underground water supply are. We know now that we are irrigating 55,000 acres around Guymon and Goodwill in Texas County where this water supply is with no apparent reduction in the water table.

We would like to have funds made available right now. The project is a cooperative project with the Corps of Engineers and the State water resources board. We would like to know the full limits of this water supply, so we can have it on record for industrial uses.

Now, from an industrial standpoint in our area, gentlemen we are just on the brink. Perhaps you have read Secretary Fred Seaton's request for 12 more helium plants such as the one we recently dedicated this past week in the panhandle. The only known source of helium is in the Guymon area. It cuts across Texas, Beaver, and Cimarron Counties in the Oklahoma Panhandle and is part of the Texas Panhandle.

This is a very vital defense program and the water supply is definitely going to be needed there.

We need a surface water supply to back up this underground water supply. We would like to know how much underground water supply is really available. With your assistance and consideration we are sure these jobs can be done at a minimum of cost and expense to the taxpayer and to the people of the United States.

Thank you.

(The prepared statement referred to above follows:)

STATEMENTS, EXHIBITS, AND RECORDS OF THE CHAMBER OF COMMERCE, GUYMON, OKLA.

The Chamber of Commerce of Guymon, Okla., respectfully submits the following statements, exhibits, and reports before the U.S. Senate Select Committee on National Water Resources, November 30, 1959, chamber of the house of representatives, State capitol of Oklahoma.

Realizing that the committee relies completely upon the integrity of the reporting agency (the Chamber of Commerce of Guymon, Okla.), we have made every attempt to authenticate and verify the statements, exhibits, and records presented at this meeting.

The geographical area covered by this report is Texas County, State of Oklahoma. It is located in the most western and northern portion of the State, commonly referred to as the Panhandle of Oklahoma. Texas County is bounded on the north by the State of Kansas, on the west by Cimarron County, Okla., on the east by Beaver County, Okla., and on the south by the State of Texas. The average elevation is 3,123 feet, the average rainfall is 19.42 inches annually, and the average annual temperature is 56.8 degrees.

The economy of the area is threefold: Agriculture, oil and gas, and manufacturing. The agriculture industry includes large grain farms, ranches and rangeland, custom feeding operations, and over 55,000 acres of irrigated land within Texas County. The oil and gas industry includes 1,387 gas wells producing 279,508 million cubic feet annually, 9 natural gas compressor stations, 169 producing oil wells, offices and warehouses for 20 major oil and gas companies, and 10 major oilfield service and supply companies. A $12½ million helium plant is located 47 miles west of Guymon with the prospect of 12 more helium plants to be located in the Guymon-Hugoton gasfield. The Guymon-Hugoton field is the only known source of helium-bearing gases in the free world. Manufacturing is related principally to the farm implement market. Adams Hard-Facing Co., Guymon, Okla., manufactures cultivator tools for nearly all of the farm manufacturers in the United States. It is presently undergoing a half-million-dollar expansion program which will increase its number of employees from 75 to approximately double that figure. There are a total of 6 manufacturing plants within the county employing over 130 people, not including the gas and oil industry employees.

The development of water resources within the county have been pursued on a Federal, State, and local level. The Optima-Hardesty project is presently undergoing a restudy by the Corps of Army Engineers to determine its economic feasibility. The State water resources board is conducting and planning a ground water study for the panhandle area. The soil conservation service is conducting an active program in cooperation with local farmers and ranchers. However, it's our opinion that further development of the Optima-Hardesty project and the ground water study are most necessary and vital to the panhandle area if it is to experience its full potential of industrial and agricultural capabilities.

THE OPTIMA-HARDESTY PROJECT

The damsite is located on the North Canadian River, about 4½ miles northeast of Hardesty, in Texas County, Okla. The project was authorized by the Flood Control Act of 1936. A total capacity of 260,000 acre-feet would provide 100,000 acre-feet for flood control and 70,000 acre-feet for irrigation purposes, with the remaining 90,000 acre-feet for sedimentation reserve at an estimated cost of $22,680,000.

Funds have been appropriated to initiate a restudy of the project in fiscal year 1959 to determine the project potentiality with regard to operation in conjunction with the existing downstream Canton Reservoir project under provisions of section 204 of the Flood Control Act of 1950. Accomplishment of the study will require coordination of the project functions with interested Federal agencies and the State of Oklahoma.

Col. Howard B. Penney, district engineer, Tulsa, has indicated that the restudy of the Optima-Hardesty project will be completed during the month of December 1959. Upon publication of the report this chamber of commerce will mail copies to all interested parties.

(Authority is correspondence, Oklahoma Water Resources Board, dated Aug. 20, 1958.)

See exhibit A for proposed dam location.

The completion of this project as originally intended would complement both the Fort Supply Reservoir and the reservoir at Canton Dam. The water impounded in the Panhandle of Oklahoma would not only serve the immediate area but it would also insure a better control of floodwater and a more consistent irrigation reserve and municipal water supply in the Fort Supply, Canton, and Oklahoma City areas. The Optima-Hardesty Reservoir would impound waters that are now being turned loose by Fort Supply and Canton during the time of floods.

The reservoir of surface water provided by the proposed Optima-Hardesty Reservoir coupled with the vast reserve of uncommitted natural gas in the panhandle area could very well bring about a most revolutionary industrial growth in the Panhandle of Oklahoma.

The cost of transporting natural gas, by pipeline, to the large industrial areas of the upper Midwest United States is becoming a burden upon the consumer. Until recently the large consumer who was using natural gas as his primary fuel could not move into the gas-producing area and purchase his fuel at a more advantageous price because virtually all the production had been committed through previous contracts. With the present porduction of deep zone natural gas, this is no longer the case. Several major companies who use natural gas as a primary fuel are already exploring the possibility of moving to the source of fuel supply rather than paying the high cost of transportation.

A large reservoir of surface water such as the Optima-Hardesty Reservoir, would serve any industry interested in locating in the panhandle area adequately and could be the balancing factor in influencing such a move.

It should be noted here that seven cities in Oklahoma and one in Kansas have forwarded resolutions to the Corps of Engineers, requesting that municipal water supply for future use should be considered in the development of a surface water reservoir at the Optima-Hardesty project. We respectfully request that this committee should give the Optima-Hardesty project its careful study and consideration and that it will see fit to recommend this project as part of the national water resources program.

GROUND WATER SUPPLY

The Oklahoma Water Resources Board, in cooperation with the Corps of Engineers, has been conducting a limited ground water study throughout the State of Oklahoma. The following quotation is from a booklet entitled "Water" published by the water resources board:

Ground water studies should be made of all important or potentially important aquifers or ground water areas of the State. Since 1950 there has been some major ground water development of virtually all the significant ground water reservoirs. It was recommended in 1955 that studies be made in 25 areas where the ground water potential was considered significant. Since then, it has become apparent that a reappraisal of the panhandle area is needed and ground water development has begun in two areas not previously considered

important. A detailed study has been started for only part of one of the 12 areas recommended to be studied by 1961. That project, financed by the Corps of Engineers, is a special study of ground water in the Arkansas Valley alluvium.

About 18 percent of the area of the State has been covered in some way by ground water studies, but detailed studies cover only 7 percent. Progress on detailed studies, in the last 3 years is at the rate of about 2½ percent of the significant ground water areas of the State each year. It is estimated that five men and the expenditure of $60,000 per year for 20 years would be required to make detailed studies of half the remaining important ground water areas. About two men and $24,000 per year would be needed to complete reconnaissance studies of the other half in 12 years. Both these schedules indicate a minimum advisable rate of progress.

(See exhibit B for ground water reserve in Texas County.)

In view of the excellent work being accomplished by this board, and keeping in mind that ground water development and surface water development must work hand in hand, we respectfully request that funds should be made available to the Oklahoma Water Resources Board for completing a detailed ground water study as outlined in their needs for the future.

SOIL CONSERVATION PRACTICES

Farmers and ranchers in the panhandle area have been adopting and developing new soil conservation practices over the past 20 years. We have found the practice of terracing and impounding a water supply in small farm ponds to be a most practical aid in the practice of soil conservation. It is our opinion that by impounding this water and by detaining the water on all rangeland and farmland that we are building cover on the watershed, which will in turn insure an even and gradual flow of water into the North Canadian River and the other waterways of this area. We feel that the practices of soil conservation are most beneficial to flood control and the large surface reservoirs and this committee should certainly consider the practices of the Soil Conservation Service as an intrical part of the national water resources program.

EXHIBIT A

Proposed Location of The Optima-Hardesty Dam

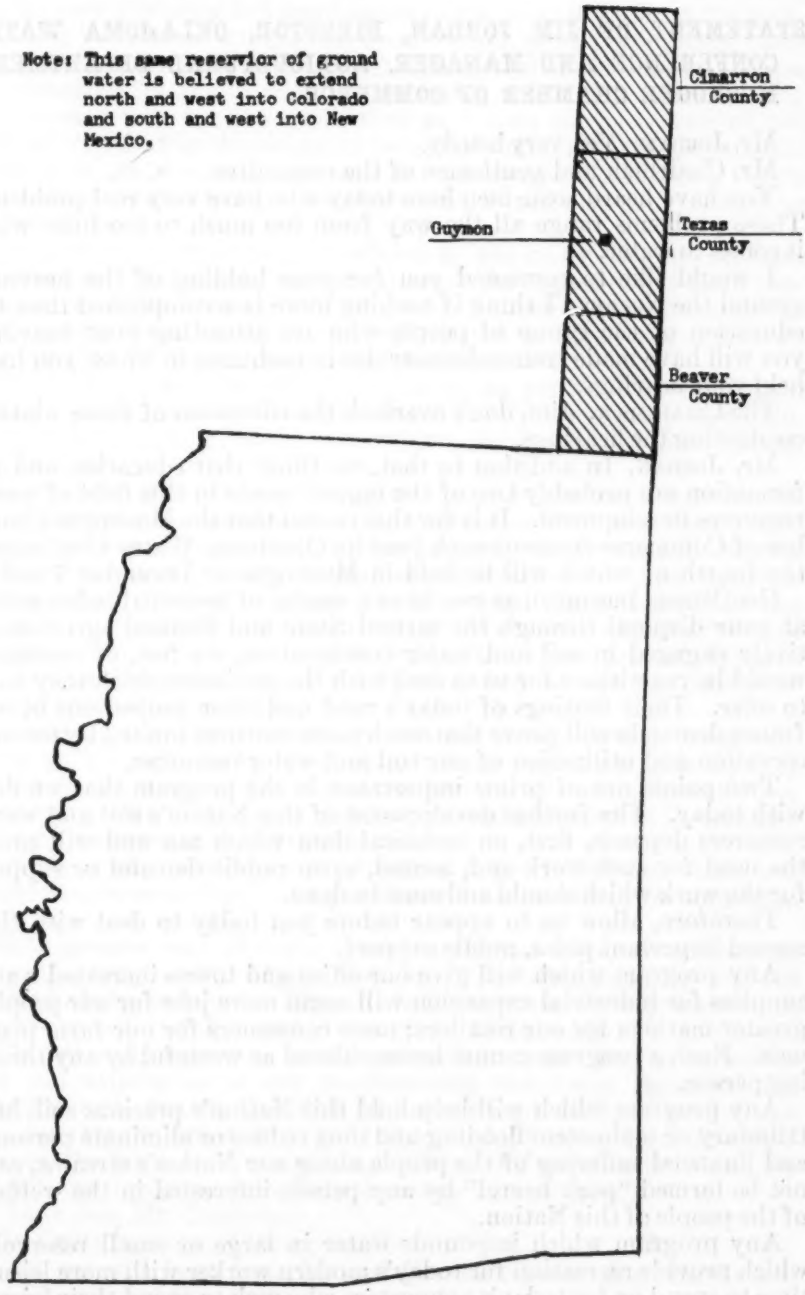
Guymon Chamber of Commerce November 30, 1959

EXHIBIT B

Under Ground Water Reserve In The

Panhandle of Oklahoma

Note: This same reservior of ground water is believed to extend north and west into Colorado and south and west into New Mexico.



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Mr. CUNNINGHAM. The next speaker is Jim Jordan, director of the Oklahoma Water Conference and manager of the agricultural department, Muskogee Chamber of Commerce.

Jim, you will be able to summarize yours.

STATEMENT OF JIM JORDAN, DIRECTOR, OKLAHOMA WATER CONFERENCE AND MANAGER, AGRICULTURAL DEPARTMENT, MUSKOGEE CHAMBER OF COMMERCE

Mr. JORDAN. Yes, very briefly.

Mr. Chairman and gentlemen of the committee.

You have heard some men here today who have very real problems. These problems range all the way from too much to too little when it comes to water.

I would like to commend you for your holding of the hearings around the Nation. I think if nothing more is accomplished than the education of the group of people who are attending your hearings you will have made tremendous strides in each area in which you have held your hearings.

The CHAIRMAN. Jim, don't overlook the education of those who are conducting the hearings.

Mr. JORDAN. In addition to that, we think that education and information are probably two of the biggest needs in this field of water resources development. It is for this reason that the Muskogee Chamber of Commerce sponsors each year its Oklahoma Water Conference, the fourth of which will be held in Muskogee on December 7 and 8.

Gentlemen, inasmuch as you have a wealth of technical information at your disposal through the several State and Federal agencies actively engaged in soil and water conservation, we feel, of course, it would be repetitious for us to deal with the statistics which they have to offer. Their findings of today's need and their projections of our future demands will prove that work must continue toward better conservation and utilization of our soil and water resources.

Two points are of prime importance in the program that we deal with today. The further development of this Nation's soil and water resources depends, first, on technical data which can and will prove the need for such work and, second, upon public demand or support for the work which should and must be done.

Therefore, allow us to appear before you today to deal with that second important point, public support.

Any program which will give our cities and towns increased water supplies for industrial expansion will mean more jobs for our people; greater markets for our retailers; more consumers for our farm products. Such a program cannot be considered as wasteful by any thinking person.

Any program which will help hold this Nation's precious soil, halt tributary or main-stem flooding and thus reduce or eliminate personal and financial suffering of the people along our Nation's streams, cannot be termed "pork barrel" by any person interested in the welfare of the people of this Nation.

Any program which impounds water in large or small reservoirs which provide recreation for today's modern worker with more leisure time to spend or for today's youngsters who seek to spend their leisure time in a wholesome manner cannot be termed as unnecessary by an

individual or group which desires to see our Nation strong physically or morally.

These several benefits are encompassed in every program of soil and water resource development this Nation now has or hopes to have; agriculture, industry and municipality must rely on water as the backbone for its future. Irrigation, flood control, power generation, navigation, recreation and municipal and industrial water supply. These are benefits of soil and water conservation work in America.

It would take far too much time to discuss the programs of soil and water resource development being carried on by the Communist nations of the world and let it suffice to say that China and Russia are making tremendous strides in these fields and may soon outstrip us in this work.

In view of the great benefits offered by our many national resource programs and because of the varied needs for expansion of these programs, we of the Muskogee Chamber of Commerce and of Oklahoma call on the Congress of the United States to accelerate America's development of our soil and water resources.

We further urge that this acceleration be provided in every field including the programs supervised by the Corps of Engineers, Bureau of Reclamation, Soil Conservation Service, and Public Health Department.

Help us realize stronger programs of navigation, flood control, soil conservation, recreation and pollution control and, gentlemen, you may be assured that we here in the great Southwest will respond with the enthusiasm and support necessary to carry such progress through both Houses of Congress. We would like to inject this one thought into our presentation of today. We would like to echo some thoughts that were formulated in 1958 at the Fifth Annual National Watershed Congress, and I think presented to you in your tour around the Nation this time.

We would like to see work begun on the formulation of a national water policy. Knowing the time it took to formulate such a policy for our own State of Oklahoma we can readily recognize the tremendous problems that you gentlemen would encounter in attempting such a step on a nationwide basis.

We know of the importance of such a policy to our own State and therefore can recognize the importance of such a policy on a national level.

With greater care of our soil and water resources, we will see an internal strengthening of our Nation. With your planning and the support of the people, we hope to see the day when every watershed, large or small, is fully treated according to its needs.

We call on Congress to help in our work toward proper conservation and utilization of our precious soil and water resources, for America is a Nation founded on the precept that no nation can long survive unless it is a good shepherd of those God-given resources, the land upon which we live and the water with which we nourish our bodies and feed the economy of our people.

Thank you, Mr. Chairman.

Mr. CUNNINGHAM. Thank you, Jim.

Next we will hear from Harold Norris, representing the Broken Bow Chamber of Commerce.

The CHAIRMAN. I would just like to call the committee's attention to the fact that the witness before the last, representing the Panhandle of Oklahoma in the extreme northwest and the witness now coming before the committee—and a very able witness—represents the southeastern county in the State which is—how far from the area represented by the second one back?

Mr. NORRIS. About 550 miles.

The CHAIRMAN. Fine.

STATEMENT OF HAROLD NORRIS, CHAIRMAN, BROKEN BOW CHAMBER OF COMMERCE

Mr. NORRIS. Senator Kerr and members of the committee, my speech has been unwound here six times or more. I just jumped them all. I would like to say this to the Senators, the visiting Senators, that all of Oklahoma truly appreciates you fellows taking the time that you need so much at home to come to our State and to work with our senior Senator.

One of the Senators said or referred to the Senator as a third Senator to his State. Senator Kerr is a third Senator for 49 States and the finest Okie that we have.

Frankly I think that if the true history is written Senator Kerr will go down in history as possessing more foresight on water development than any other man in the history of the Nation.

I do think that the development of our water is as urgent as our defense program is. I think we are getting less than one-fourth of the appropriations that should be granted to this program of conserving our land and our water.

A nation that conserves its resources is a strong nation.

And above all they refer to your program, Senator Kerr's program, as a pork barrel situation. The increase of taxes brought about by the construction of these reservoirs and so forth more than offsets. It is an intangible benefit that is never figured into these things. This situation is not a pork barrel situation as it is commonly referred to.

It is one of the most needed, one of the widest developments that this committee that has taken the time to go all over the United States for and with the very able help of our Corps of Engineers they should not be neglected in this wonderful development that is being attempted all over. But it will go down—this committee has the opportunity to be the greatest, to be the most important committee that was ever formed in the United States.

Gentlemen, thank you for your consideration and thank you for coming to Oklahoma.

The CHAIRMAN. Thank you very much.

(The prepared statement follows:)

STATEMENT OF HAROLD NORRIS, CHAIRMAN, BROKEN BOW CHAMBER OF COMMERCE, RE LITTLE RIVER BASIN IN MCCURTAIN COUNTY, OKLA.

Gentlemen, the runoff waters that feed these streams, Mountain Fork River, Glover River, and Little River to wit, is free from any mineral deposits of any kind. This results in the very highest quality water that is to be found anywhere.

Since statehood, we have been plagued with very destructive floods. Since the forests have been cleared of intense timber growth, our floods have been

more often and much more destructive. Our people have repeatedly tried to substain the floods and make a living. The frequency and character of these floods have forced our people out of each of these river basins. Actually our population has been cut in half in the last 25 years.

We people in McCurtain County have actively been seeking flood control on these streams (Mountain Fork, Glover, and Little River) since the year of 1921.

We believe that the strongest defense preparation that could be, would be that of developing our resources at home in such a manner that we would be in position to meet any emergency.

When and if flood control and water conservation reservoirs are constructed on Mountain Fork, Glover, and Little River in McCurtain County, industrial, agricultural, and recreational establishments will utilize all of the water made available by such reservoirs.

It is our sincere belief this development will take place within 10 years after the water and flood protection is available and there will be a demand for more water than is now planned in authorized projects on these streams.

Such development as this would double our population in a short 10 years. The tax take from this area would more than triple. The vast supply of this superior quality of water could be utilized to strengthen the economy of the entire southwest part of the United States.

Southeastern Oklahoma needs these streams to be controlled from floods, and all industrial waters to be available at the earliest possible moment.

Mr. CUNNINGHAM. Next we will hear from Harold Cooksey, president of the Central Oklahoma Water Users Association, representing the Norman Chamber of Commerce.

The CHAIRMAN. I do not know where a man could come from that would be more nearly in a spot which is exactly an equal distance from the area represented by Mr. Norris and the area represented a while ago by the man who spoke from the Panhandle.

Harold, we are glad to see you here.

STATEMENT OF HAROLD COOKSEY, PRESIDENT, CENTRAL OKLAHOMA WATER USERS ASSOCIATION

Mr. COOKSEY. Mr. Chairman, and members of the committee, there is just one thing I want to clear up on your program there. I am president of the Central Oklahoma Water Users Association, but not a delegate representing the Norman Chamber of Commerce. The reason I make that distinction is because there are three cities involved in the Central Oklahoma Waters Users Association, namely, our friends out here at Midwest City and Dell City and I represent those two cities as well as Norman.

There has been much said and written about the project that we have. Senate bill 1892 was heard, that is, we had the hearing on that on August 12 and that is already a matter of publication. We would suggest that the minutes of that hearing be incorporated in your hearing here, as well as the formal statement which I have already presented and in the interest of brevity and I know you fellows are getting tired, I will leave that with you.

Thank you.

The CHAIRMAN. Thank you very much, Harold.

We will be glad to have your statement here made a part of the record.

Mr. COOKSEY. Fine.

Mr. CUNNINGHAM. Thank you, Harold.

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(The prepared statement referred to follows:)

PREPARED STATEMENT OF HAROLD COOKSEY, PRESIDENT, CENTRAL OKLAHOMA WATER USERS ASSOCIATION

Mr. Chairman and members of the committee, my name is Harold S. Cooksey. I am in business in Norman, Okla., and president of the Central Water Users Association.

In central Oklahoma we are particularly interested in the development of a surface water supply, primarily for the cities of Del City, Midwest City, and Norman. These three cities have formed the Central Oklahoma Water Users Association for the purpose of constructing a dam on the Little River about 12 miles east of Norman. With the help of the Bureau of Reclamation and consulting engineers we have prepared a proposal which would by virtue of the dam, create a reservoir of sufficient size to provide a municipal and industrial water supply for the three project cities for a period well beyond the year 2000.

For the complete details of this proposal, we refer you to House Document 420, 85th Congress, 2d session. Reference is also made to the Senate bill 1892 passed by the Senate in the 86th Congress, 1st session; and the transcript of hearings on Norman project, Oklahoma, before the Senate Subcommittee on Irrigation and Reclamation, presented August 12, 1959.

As indicated in these reports the project cities are presently dependent upon an underground water supply. Engineering studies point to a steady and somewhat alarming drop in the water table of the wells which are drawing down water from a formation known as the Garber-Wellington sandstone. This, together with the fact that the project cities are experiencing great increases in population, demands that we plan now for new sources of supply. As an example, the following table of Norman's anticipated future population and water use report, prepared in 1958 by the Peach-Reid report, Oklahoma University, is submitted:

	1958	1975	2000	2025
Population	39,200	61,000	95,000	129,000
Water (all sources), gallons per capita per day	110	160	206	250
Total demand (million gallons daily), all users	5.17	9.8	19.5	32.2

Adding to the problem is the fact that in the immediate area to be served by the project are such large installations and institutions as Tinker Air Force Base, the Central State Hospital (3,000 patients), and the University of Oklahoma. These institutions, too, are expected to grow and develop increased water demands.

Insofar as the central Oklahoma area is concerned, we believe that Norman project, Oklahoma, can supply adequate water for the project cities and the other installations and institutions for many years. At the same time we heartily endorse project HOW, the proposed central-southeast Oklahmoa canal project, which has or will be explained more fully by others at this hearing. Because of the magnitude of project HOW, it is anticipated that Norman project, Oklahoma, will be completed several years prior to the completion of the canal system. However, upon the ultimate completion of project HOW, we believe that the Norman project reservoir will become a highly important link and be completely integrated with this facility.

Needless to say, the development of these water projects will help tremendously in the building of this area and the entire Nation industrially. Also it will go a long way in solving our economic problems. By providing more industrial jobs it will ease the increasing rural-to-urban migration. And by conserving our water resources it will provide irrigation, flood control, and other benefits far in excess of project costs.

Mr. CUNNINGHAM. The next witness is Judge William Jones, chairman of the Water Resources Committee, McAlester Chamber of Commerce.

STATEMENT OF JUDGE WILLIAM JONES, CHAIRMAN, WATER RESOURCES COMMITTEE, McALESTER CHAMBER OF COMMERCE

Judge JONES. Senator Kerr and members of the committee, I appear here as a representative of the chamber of commerce, being chairman of the water resources committee.

I also am a director of the Arkansas Basin Association, director of Lake Eufaula Development Association, and a member of the Mississippi Valley Association. I have also been appointed as an alternate member of the tristate committee by Gov. J. Howard Edmondson.

In presenting this we recognize the importance of the need for the development of water resources in Oklahoma and in the Nation and are happy to represent southeastern Oklahoma or part of southeastern Oklahoma.

Eastern Oklahoma, of which McAlester, Okla., is one of the key and important trading centers, has suffered a continuous loss of population for the past 10 years. In support of requests for appropriations for development of the Arkansas Basin we have furnished the committees of the U.S. Senate and a committee of the House of Representatives information and data in support of these water programs.

In support of these programs we have used the agencies such as county agents, public relief agencies, and the U.S. Employment offices in the Lake Eufaula area, and did make and present to committees of both House and Senate analyses of what our reports discovered. We found that over a period of 10 years we had lost population.

Statements from the county agents based on a 5-year survey from 1950 to 1955, showed a loss from 50 to 200 farm units in each county per year. It was disclosed that 50 percent of the farmers remaining on the farms depended on outside work in order to survive and stay on their farms. It was also disclosed that 85 percent of the farms sold less than $250 per year on the open market from these submarginal farms.

In order to make a complete economical unit, small units are being combined and added to the larger units, but with a resulting loss of population.

Information from the relief offices in these nine counties which is verified by a map printed in the Daily Oklahoman showed the relief load varied in the counties from 26 to 52 percent of the population in this nine-county area receiving some type of Government aid. The figures from the U.S. Employment Office also reflected a heavy load on the rolls of unemployment and those seeking employment.

Eastern Oklahoma, which McAlester is in the center, contains natural resources of the finest—semianthracite coal, highest grade of bituminous coal in the world, limestone, building stone, lead and zinc and numerous other resources that are limited as to production because this area's transportation cost will not allow this area to compete costwise with other areas of the United States.

I think a record that has been filed here shows that McAlester is in the center of the coal area there has 5 billion tons of the highest type coal.

We join with the Arkansas Basin group, the Oklahoma City representation in presenting the need for the installation of a lock in the

Eufaula Dam which is now under construction so as to provide a connection between the Arkansas and the Verdigris navigation channel and the central Oklahoma project which would be less expensive to build one than later, at the present time.

This would also open to low-cost water transportation the highest quality of coal reserve in this area and pioneer in the glass industry and the building of this canal would open an area where McAlester, Heneeta, the coal centers of Oklahoma, would have available water transportation to put this important resource that they have, on the national market.

Oklahoma cannot move ahead until our water resources are developed. The relief cost will be a constant cost to the Government throughout this area unless we have a program that will open this area to industrial development through the development of our water resources which will make it possible for our people to be gainfully employed. The development of our water resources is the only long-time program that we can expect to improve the economic conditions of this area.

I might say to you gentlemen that the statistics have shown that we have four counties in the State of Oklahoma that during the depression period had a great percent of people on public relief. We have a great percent today and it is because we have not developed the resources of the area of eastern Oklahoma and the resources of the Arkansas Basin, and with the Government carrying that load we figure that it is better from an economic standpoint that the Government spend money to develop resources rather than to keep people on some type of a Government relief roll.

We know it will be a great deal more for the people and we think it will be a relief to the economy of the Nation and the State if this program is developed and we can have the benefit of this water development program which would bring industry into this great valley.

Thank you, gentlemen.

The CHAIRMAN. Thank you, Judge.

(A prepared statement follows:)

Gentlemen, recognizing the importance and need of the development of the water resources in Oklahoma and in the Nation, the following from McAlester, Okla., are appearing before this committee today:

Wm. Jones, attorney, director of the Arkansas Basin Association, director of the Lake Eufaula Development Association and a member of the Mississippi Valley Association; chairman of the Water Resources Committee of the McAlester Chamber of Commerce and alternate member of Tri-State Committee from Oklahoma, appointed by Gov. J. Howard Edmondson.

Louis Gaberino, owner and operator of the Oklahoma Tire & Supply Cos., situated in McAlester, Eufaula, Checkotah, Hartshorne, Antler, and Atoka; president of the McAlester Chapter of the Lake Eufaula Development Association and member of the water resources committee of the McAlester Chamber of Commerce.

Rex Ross, manager of the McAlester Chamber of Commerce.

NEED OF DEVELOPMENT OF WATER RESOURCES IN OKLAHOMA

Eastern Oklahoma, of which McAlester, Okla., is one of the key and important trading centers, has suffered a continuous loss of population for the past 10 years. In support of request for appropriations for development of the Arkansas Basin we have offered before the committee of the U.S. Senate and the committee of the House of Representatives information and data that we feel justifies the development of our water resources and especially the development of the Arkansas Basin. In presenting this to the committees of Congress we

secured data from the county agents, public relief agencies and U.S. employment offices in nine counties in the Lake Eufaula area. In order to make this statement brief, we will analyze what this 30-page report disclosed:

LOSS OF POPULATION

Statements from the county agents based on a 5-year survey from 1950 to 1955 showed a loss from 50 to 200 farm units in each county. It was disclosed that 50 percent of the farmers remaining on the farms depended on outside work in order to survive and stay on their farms. It was also disclosed that 85 percent of the farms sold less than $250 per year on the open market from these submarginal farms. In order to make a complete economical unit, small units are being combined and added to the larger unit, but with a resulting loss of population.

ECONOMICAL CONDITION OF THE AREA

Information from the relief offices in these nine counties, which is verified by a map printed in the Daily Oklahoman, showed the relief load varied in the counties from 26 to 52 percent of the population receiving some type of Government aid. The figures from the U.S. Employment Office also reflected a heavy load on the rolls of unemployment and those seeking employment.

RESOURCES OF THE AREA

Eastern Oklahoma contains natural resources of the finest: semianthracite coal, highest grade of bituminous coal in the world, limestone, building stone, lead and zinc, and numerous other resources that are limited as to production because this area's transportation cost will not allow this area to compete costwise with other areas of the United States.

CONCLUSION

Oklahoma cannot move ahead until our water resources are developed. The relief cost will be a constant cost to the Government throughout this area unless we have a program that will open this area to industrial development through the development of our water resources which will make it possible for our people to be gainfully employed. The development of our water resources is the only longtime program that we can expect to improve the economic conditions of this area.

Respectfully submitted.

WM. JONES, *Chairman,*
LOUIS GABERINO, *Member,*
REX ROSS, *Manager,*
Chamber of Commerce, McAlester, Okla., Water Resources Committee.

Mr. CUNNINGHAM. I want to thank members of our discussion panel for reducing their discussion as much as they have.

The next subject is industrial water requirements.

The coordinator is Mr. H. L. Schall, executive vice president, Chamber of Commerce of the State of Oklahoma.

Mr. Schall?

The CHAIRMAN. Come around, Herb.

STATEMENT OF H. L. SCHALL, EXECUTIVE VICE PRESIDENT, CHAMBER OF COMMERCE, STATE OF OKLAHOMA, INC.

Mr. SCHALL. I am here, Senator.

Mr. Chairman and members of the committee, ladies and gentlemen, the significant thing about this hearing today to me has been the obvious unity of thinking and the obvious unanimity of purpose. You have heard people testify for various projects, for various programs, from various geographical areas of the State, and practically all of them have very generously and very broadmindedly brought in

the various benefits, the many benefits which will accrue to other areas and to other phases of the economy.

We felt, however, although industrial needs have been mentioned many times on the program today, that perhaps we should pinpoint the industrial requirements with two very brief presentations, partly for the enlightenment of the rest of us and for the committee perhaps more especially for the benefit of those people who do not know the difference and cannot tell the difference and perhaps do not know the difference, do not care to know the difference between the expenditures and investments in the future.

We feel the industrial phase of water development means more jobs, more business, more people, more people gainfully employed, and if you please, a better and a broader tax base for the return of the investment which the Government will make in order that that return may be reinvested in other worthwhile projects looking toward the conservation of our natural resources.

Our first speaker is Mr. Paul Strasbaugh, the industrial development specialist. He has been director of the industrial development for the Oklahoma City Chamber of Commerce for 12 years, a former vice president of the Oklahoma Development Council, executive vice president of Oklahoma Industry, Inc., a member of the Industrial Development Council of America.

Mr. Paul Strasbaugh.

STATEMENT OF PAUL STRASBAUGH, DIRECTOR, INDUSTRIAL DEVELOPMENT, OKLAHOMA CITY, OKLA.

Mr. STRASBAUGH. My name is Paul B. Strasbaugh and I am appearing in behalf of the Oklahoma City Chamber of Commerce and the Water Development Foundation of Oklahoma.

As director of industrial development for the Oklahoma City Chamber of Commerce and executive vice president of Oklahoma Industries, Inc., for the past 14 years, I have become familiar with Oklahoma's industrial water problems and, generally, the problem of our industrial water use region of the Arkansas-White-Red Rivers.

The committee is well aware of the correlation between availability of industrial water and the development of the industrial complex of the Nation. However, it is interesting to note the geographical distribution of water-using industries.

We have prepared a table from Bulletin MC–209, U.S. Department of Commerce, entitled "Industrial Water Use." All these figures are based on the 1954 census of manufacturers and of course will be enlarged when the 1958 census of manufacturers, figures become available.

(The table referred to follows:)

Industrial water use regions of the United States

Region	Establishments	Gross intake over 20,000 per year
Cumberland	648	26
New England	13,176	845
Delaware and Hudson	40,276	1,286
Chesapeake Bay	7,053	492
Eastern Great Lakes and St. Lawrence	11,904	1,108
Ohio	12,276	1,252
Tennessee	1,664	166
Southeast	13,329	869
Western Great Lakes	14,576	1,206
Upper Mississippi	9,311	810
Lower Mississippi	2,080	210
Total East	126,293	8,272
Missouri	4,404	262
Arkansas-White-Red	4,401	289
Western Gulf	4,997	317
Colorado region	687	37
Great Basin	515	56
California	12,616	592
Pacific Northwest	5,350	401
Total West	32,970	1,954
Total United States reporting	159,263	10,226

This table shows the 18 water industrial water regions of the United States and shows the distribution of water-using industries located in these 18 regions.

There were 159,263 reporting in the 1954 census. Of this number 10,226 used in excess of 20 millions gallons a day.

I would like to point out to the committee that it is not uncommon for some industries to use 20 million gallons a year and it is not uncommon for some industries to use that much in 1 day.

The attached map shows the distribution of the industries in the tables. You will note that 80 percent of all industries reporting are located in the eastern part of the Nation and including the upper and lower Mississippi regions, this represents 11 industrial water-using regions. Only 20 percent of the total reporting industries are located in the seven western industrial water-using regions.

Another important fact to be drawn from the table is the location of industries using in excess of 20 million gallons annually. This industrial group is generally regarded as basic industry, the prime mover of industrial and economic growth. Here we find that 79 percent of the 10,226 industries are located in the 11 regions and only 21 percent are located in the seven western regions.

It is conceded, of course, the eastern regions have a longer history of development behind them and the western regions are relatively new; however, it is evident that the industrial-economic growth of the West has been and will continue to be directly tied to the development and conservation of water resources.

We recognize water is a national problem and this testimony is in in no way intended to play one area of the Nation against the other. There is a strong evidence to show the well-watered areas of the industrial East are being plagued with water problems.

Recently we in Oklahoma have been discussing industrial locations with a firm located not too far from the Nation's Capital. This firm has been in this location for over 50 years and expanding steadily.

Within the past few years they have reached the extent of their expansion potential in this present location due to water problems. Since water is the critical location factor from the standpoint of volume and quality, they have examined a wide area for their new plant location.

To my great surprise they told me recently the most desirable location they have found from the water standpoint is the Province of Ontario in Canada. This is not to say the plant will be located there, but it does point up sharply the problems of one industry and I'm sure this is only one of many such problems that occur each year.

In conclusion I would like to commend this committee for the great work they are doing. I can think of no problem more important to the future economic-industrial growth of this Nation than the development and conservation of our water resources.

Thank you, gentlemen.

The CHAIRMAN. Thank you very much, Paul.

(The map referred to earlier follows:)

TOTAL EAST
11 INDUSTRIAL WATER USING REGIONS
126,293 INDUSTRIES
80% OF TOTAL
8,272-INDUSTRIES
79% OF TOTAL
TOTAL WEST
7 INDUSTRIAL WATER USING REGIONS
32,970 INDUSTRIES
20% OF TOTAL
1,954 INDUSTRIES
21% OF TOTAL
0 100 200 300 400
MILES
U. S. TOTAL - 18 INDUSTRIAL WATER USING REGIONS
159,263 WATER USING INDUSTRIES REPORTING
10,226 INDUSTRIES USING IN EXCESS OF 20,000,000
PER YEAR
SOURCE: 1954 CENSUS OF MANUFACTURERS
U. S. DEPARTMENT OF COMMERCE

Mr. SCHALL. For the next statement I am pleased to call on C. N. Sliepcevich, associate dean, Engineering College, University of Oklahoma, long associated with water development.

The dean with testify on the effect of water on industry.

Dr. Sliepcevich.

STATEMENT OF DR. C. N. SLIEPCEVICH, ASSOCIATE DEAN, ENGINEERING COLLEGE, UNIVERSITY OF OKLAHOMA

Dr. SLIEPCEVICH. Senator Kerr, distinguished members of the Select Committee on National Water Resources.

Because time is running very short, I would like to confine my remarks to the potential development of the chemical industry in this area.

Presently the pattern of the chemical industry as it is now located is on the east coast and in our gulf coast area. As a matter of fact, approximately 85 percent of the petrochemical industry which is the chemical industry based on petroleum is located within the 200-mile radius of Houston. The reason that the growth of the chemical industry has occurred on the east coast and in the gulf coast region is primarily because of three factors:

1. First, of course, the proximity of markets;
2. The availability of raw materials; and
3. The availability of water, both for industrial and transportation purposes.

Since 1940 the petrochemical industry has grown very rapidly to the point where it now represents over half of the total value of chemicals produced in this country.

Over the next 10 years the volume of chemicals produced in this country is estimated to be double our production for 1958.

The CHAIRMAN. Over the next what period?

Dr. SLIEPCEVICH. Over the next 10 years.

The CHAIRMAN. Yes.

Dr. SLIEPCEVICH. The problem that we now face is primarily the shortage of water. As a matter of fact, the gulf coast has just about reached its full capacity for chemical development because they have run into brackish water problems.

The east coast, of course, has reached its point of maximum development and as far as the west coast goes, we have the same problems there. The only way the west coast could possibly develop further in chemical lines is to either resort to saline water conversion or to bring water from great distances, both of which would be at very staggering costs.

It would appear that the next area for logical development would be in the area encompassed by Oklahoma and surrounding States. There are several reasons for this belief. One is, to cite a very dramatic example, within a 50-mile radius of Oklahoma City, we could today based on present production report over a billion dollars a year worth of chemicals.

The other factor that is most important is—this was from the standpoint of raw materials, or petroleum production.

The other factor of considerable importance is the availability of water both for industrial consumption and for transportation purposes.

To give you some figures, a typical ethyl alcohol plant will consume roughly around 150 million gallons a day of water. I understand from our people who have made a study of the potential water resources in this area, we could support very easily more than 20 percent of the present chemical industry in this Nation.

A factor which we must not overlook which was very definitely brought to my mind when I visited the Russian science and industry exhibit last summer in New York, is the number of projects of hydroelectric and water conservation projects that they have initiated within the interior of Siberia.

In the same respect, the State of Oklahoma represents very closely the geographic center of this Nation. If we continue to promote industrial expansion on our coastal areas we are laying ourselves vulnerable to attack. So for the reasons of raw materials, availability of water, both for transportation and industrial consumption, the facts that we have one of the best labor markets in the country here and the fact that we are located within the interior of the Nation and we are daily drawing closer to the center of population all would tend to support the beliefs that the next center of chemical development will be in this area.

Thank you.

The CHAIRMAN. Thank you very much, Doctor.

Is there a question?

Senator CASE. Mr. Chairman, I do not want to disturb the harmony and unity of this meeting but just a few weeks ago there was a marker dedicated up in South Dakota which was supposed to be at the new geographical center of the United States since the admission of Alaska and Hawaii.

Dr. SLIEPCEVICH. I retract my statement.

The CHAIRMAN. I want to tell you the 49th and 50th States sure have played hob with a lot of things. We are still operating under the old schedule, Senator.

Dr. SLIEPCEVICH. Thank you.

Mr. SCHALL. Thank you, Dr. Sliepcevich.

Now, may I turn the meeting back to Mr. Guy James for a closing statement.

Thank you very much.

Mr. JAMES. Ladies and gentlemen, we promised these distinguished visitors that they would be out of here by 3:30. We must not impose upon their good nature any longer.

Before I turn this meeting back over to Senator Kerr, I think we should recognize a visitor who I notice came in a few minutes ago, Col. Howard W. Penny from Tulsa.

Colonel Penny, would you stand up, please, sir?

Now, Senator Kerr, this concludes our program and I will give the meeting back to you.

I think we are about 10 or 15 minutes late, but we certainly appreciate the patience that you gentlemen have displayed. Thank you, sir.

The CHAIRMAN. Thank you very much, Guy.

My thanks to every person who has appeared here. We want those who did not appear, if they have statements to go into the record, to give them either to Mr. James or to my office; it will be made a part of the record.

I want to thank again my colleagues in the Senate for coming down here and honoring us with their presence. I know they are going away with a bright new understanding of Oklahoma's hospitality and also I hope with a clear understanding that Oklahoma, as is the case with the States they represent, is looking forward to the opportunity for growth and expansion through a greater conservation of its soil and water resources.

This has been one of the finest hearings we have had. To me, of course, it has been the finest. But I want to say to you who have come here and made your contribution and others who have come here to listen, that this meeting is symbolic of every one of the other 17 hearings we have had and dramatizes the fact that water conservation is of transcendent importance everywhere in the country. As we go from State to State, and when we receive the reports from those States we are not able to visit, getting the sum total of the water needs of all of the States in the country, we will then be able to report back to the Senate on the combined needs for water development in our country.

That concludes our hearing here, and we thank you very much for being here.

(Whereupon, at 3:45 p.m. November 30, 1959, the committee recessed.)

(Subsequent to the closing of the hearing the following letter and statements were received:)

DEPARTMENT OF THE INTERIOR,
SOUTHWESTERN POWER ADMINISTRATION,
Tulsa, Okla., November 27, 1959.

HON. ROBERT S. KERR,
Chairman, Senate Select Committee on National Water Resources,
Oklahoma City, Okla.

MY DEAR SENATOR KERR: The U.S. Senate deserves commendation for its creation of the Select Committee on National Water Resources, of which you are chairman. Every American citizen should be aware of the fact that our future national economy and welfare will almost entirely depend upon our water supply.

This Administration, whose primary function and interest is in the marketing of hydroelectric power and energy produced at Federal projects in this area, is vitally interested in the development of our water resources for the greatest benefit to the Nation. It is our policy to strongly advocate the initial construction of reservoir projects to the maximum possible storage in order that future high priority needs may be supplied. After a project has been consctructed and has operated over a period of years, an increase in storage becomes economically impossible unless provision has been made in the initial acquisition of lands and easements for this improvement.

Another factor to be considered is the ultimate effect on the water yield of our streams, of the maximum development in upstream land treatment, waterflow retardation, and similar improvements. While there can be no objection to any man's use of such water necessary for his health and the general economic welfare, nevertheless, if the storage of water is such that increases in evaporation, together with transpiration losses, occur without an increase in benefits, the only result is useless reduction in quantity of water available for downstream uses. Some phases of the land program may also result in undue reduction of streamflow during critically dry periods. These improvements could possibly result in lengthening the duration of critically dry periods with much less quantity of water available even though the reduction of the average annual yield be relatively small. There must eventually be a balance reached which will result in maximum benefits to all concerned.

This Administration has recently been conducting an office investigation of the potential peaking capacity available from the installation of pumpback hydroelectric projects around reservoirs such as Tenkiller Ferry on the Illinois River, and Beaver, Table Rock, and Bull Shoals on the White River where sites exist

for installations of 150 to 400 feet head with minimum pool areas and storages and requiring no afterbay structure. Two sites on Tenkiller Ferry Reservoir have been investigated. One site could be developed with a reservoir surface area of 2,200 acres and total storage of approxicately 80,000 acre-feet of which 15,000 acre-feet would be the power pool. With pumping during offpeak hours and generating during peaking hours, the installation could produce approximately 100,000 kilowatts of peaking capacity and peaking energy of approximately 1,800 kilowatt-hours per kilowatt of installation per year with a daily fluctuation in the Tenkiller Ferry Reservoir of less than a foot. A second site could be developed with a head of 265 to 300 feet, a surface area of approximately 3,000 acres and a total and power storage of 340,000 acre-feet and 20,000 acre-feet, respectively. This project could produce approximately 200,000 kilowatts of peaking capacity with accompanying energy of 1,800 kilowatt-hours per kilowatt of installation per year with a daily fluctuation in the Tenkiller Ferry Reservoir of approximately 1½ feet. Neither of these installations would require spillway construction for protection of the structure, as their drainage areas are very little larger than the pools. The cost and other economic phases of the projects have not been fully investigated. However, it has been tentatively estimated that these projects could be constructed for a cost of $100 to $125 per kilowatt comparable with steam installations. Offpeak energy for pumping could be obtained from fuel electric installations in the area and would result in firming up their installations with the additional offpeak load.

It is conservatively estimated that more than 1 million kilowatts of peaking capacity could be economically produced from sites in this area alone.

The inclusion of side reservoir pumpback, such as the above, into the interconnected system of this Administration would further implement the present integration of peaking hydroelectric capacity and energy with fuel electric generation in this area.

Sincerely yours,

DOUGLAS G. WRIGHT, *Administrator.*

CITY OF BLACKWELL,
Blackwell, Okla., November 27, 1959.

U.S. SENATE SELECT COMMITTEE ON NATIONAL WATER RESOURCES.

GENTLEMEN: The city of Blackwell is not at all sure of the adequacy of a sound and lasting water supply. The serious threat of depletion and pollution has strongly stressed the importance of seeking a more dependable municipal water supply. It is anticipated that Blackwell will require 10 million gallons of water per day in 1980 for industrial and domestic use, based on an estimated population forecast of 20,000 in 1980.

We, the city officials, believe that this need could be corrected by proper surface storage to have a visible supply of water as would be furnished by the Kaw Dam and Reservoir.

We, therefore, would like to join with other municipalities situated in Kansas and Oklahoma, in support of the Kaw Dam and Reservoir.

We are ready to join together with those representing municipalities and other participating groups in the areas mentioned above, to present a united front in order that the many preliminary, as well as final phases of this project may be carried out in proper sequence and with the proper Federal agencies and legislative bodies.

R. C. WEISBROD, *Mayor*
(Signed in behalf of the city of Blackwell, Okla.).

STATEMENT OF SOUTHERN OKLAHOMA DEVELOPMENT ASSOCIATION

PURPOSE OF WATER DEVELOPMENT

Our organization, Southern Oklahoma Development Association, is dedicated to the promotion and development of this area of Oklahoma. To best expand our economy and develop our natural resources, we feel that proper development of water is of primary importance. We need a visible source of water to interest outside industry who would utilize the large reserves of high quality glass sand, dolomite, rock asphalt, limestone, and many other other minerals

plentiful in the area. We need adequate supplies of water to assure our own locally developed business; ample water for normal profitable growth. The Arbuckle project fulfills the above requirements; therefore, this organization has lent its full support to the promotion and development of this reservoir. Our locality in Oklahoma has historically been an economy of farming and ranching. With the advent of mechanization and the subsequent forming of larger farm units, there developed a new source of income to the area. Recreation fills some of the gap left in our economy by those families who went to town to find jobs. Providing a visible source of water such as the Lake of the Arbuckles will enhance the recreational possibilities in the area. Much comment on this particular aspect of the project and its effect can be found in a report by Ben R. Chambers, park landscape architect, region 3 office, National Park Service, Department of the Interior.

NEED FOR WATER DEVELOPMENT

There are four major entities vitally interested in the Arbuckle project. They are Sulphur, Davis, Wynnewood, and Ardmore, Okla. These four cities contemplate two major industrial uses for water. They are the Wynnewood Refinery, which now uses in excess of 1 million gallons daily, and the Ardmore Air Force Base, which has been turned back to the city of Ardmore for industrial development. At some future time there will certainly be found a demand on these communities for more water for normal expansion of these facilities. Every town affected by this project depends upon ground water for its needs. Conditions today indicate that we will need much more water in the future. Population is increasing and per capita consumption is up, but our water table is falling. It is the opinion of this group that this is not a temporary condition, although it has been aggravated by drought in recent years.

Specifically, Ardmore has a source of water from wells on Caddo Creek and from a city lake which is not adequate. Caddo Creek is the only source of a usable quality water in the area. Wells in this area are charged by surface water carried by the stream. In time of drought this source is not dependable. Sulphur depends upon wells entirely for a water supply. These wells are said to be charged by an artesian basin directly east of Sulphur. This source has been adequate to date, but is failing. It is generally agreed by geologists and hydrologists that the city of Ada, population 35,000, derives its water from the same source as Sulphur. The city of Ada is drilling new wells over this basin to supplement its failing supply. A new and elaborate irrigation project utilizing deep wells over the basin has only recently gone into operation. Davis and Wynnewood have to a great extent the same source of ground water. Both of these communities receive water from wells which are charged by the Washita River. These communities have had severe water shortages in the past when the Washita River would become low and the water table fall. With the construction of Foss and Cobb Creek Dams on the upper tributaries of the Washita, Davis, and Wynnewood can expect an even more undependable source of water. These arguments, we feel, show conclusively the need for a large reservoir in the area.

USE OF WATER IN THE AREA

Our organization feels that the most important use of water is man's consumption and enjoyment. A water supply should insure these basic needs. In years just past water supplies have failed on farms and ranches. In the cities of the area, water supplies would have failed completely but for controlled use and water rationing. Filling stations in Ardmore, Davis, and Wynnewood had to suspend carwash operations. A refinery in Ardmore had to curtail production. Watering lawns and yards had to be outlawed. During the drought, Wynnewood did not have enough water to fight a fire that broke out at a lumber yard there. This is water supplying a man's basic need, man's consumption and enjoyment. We feel that a community is entitled to more than a basic need. They should have water for industrial expansion, for irrigation, and for the orderly expansion and growth of the area in which they live. The Arbuckle project will assure this condition in southern Oklahoma.

CHARACTERISTICS OF THE ARBUCKLE PROJECT

The dam will be located on Rock Creek at the junction of two tributaries, Buckhorn and Guy Sandy Creeks about 6½ miles southwest of Sulphur on State Highway 110. The reservoir is centrally located to all the interested cities and

is scenically located in the Arbuckle Mountains. The lake will have between 4,000 and 5,000 surface acres and will yield 25 million gallons of water daily during critical periods. This lake will fulfill all aspects of purpose, need, and use of water which we contemplate. It will supply present water needs lavisly and economically. It will provide future industrial, or what could be called growth water. It will further develop recreational facilities that in turn will accelerate growth of the area.

THE NEED FOR FEDERAL FINANCING

Southern Oklahoma Development Association advocates Federal financing of projects such as these because of stringent municipal laws under which we operate in Oklahoma. One of the laws under which we operate is the legal limit of bonded debt for municipalities. All of the cities involved in the Arbuckle project have a heavy bonded indebtedness. Very few municipalities receive any revenue from ad valorem taxes in Oklahoma. For the most part cities receive revenue from the sale of water. This of course is barely enough to operate the city. Very few cities have sinking funds or reserves for replacement of water lines, sewer lines, and stand towers. All replacements and additions of this nature are financed through bond issues. For this reason bonded debt is heavy in all cities interested in the Arbuckle project. It is a fact that the only way such a project could be managed is by financing through the Federal Government for repayment as set up by the Bureau of Reclamation. All of the cities planning to take water from this reservoir will be bonded near their statutory limits to pay for distribution lines, stand towers, and filtering stations necessary to utilize water from the project. Our organization feels that nothing could be fairer than for the Federal Government to finance projects of this type which add to our Nation's capital structure and increase national income for we feel that what is good for a single locality is good for the Nation as a whole.

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